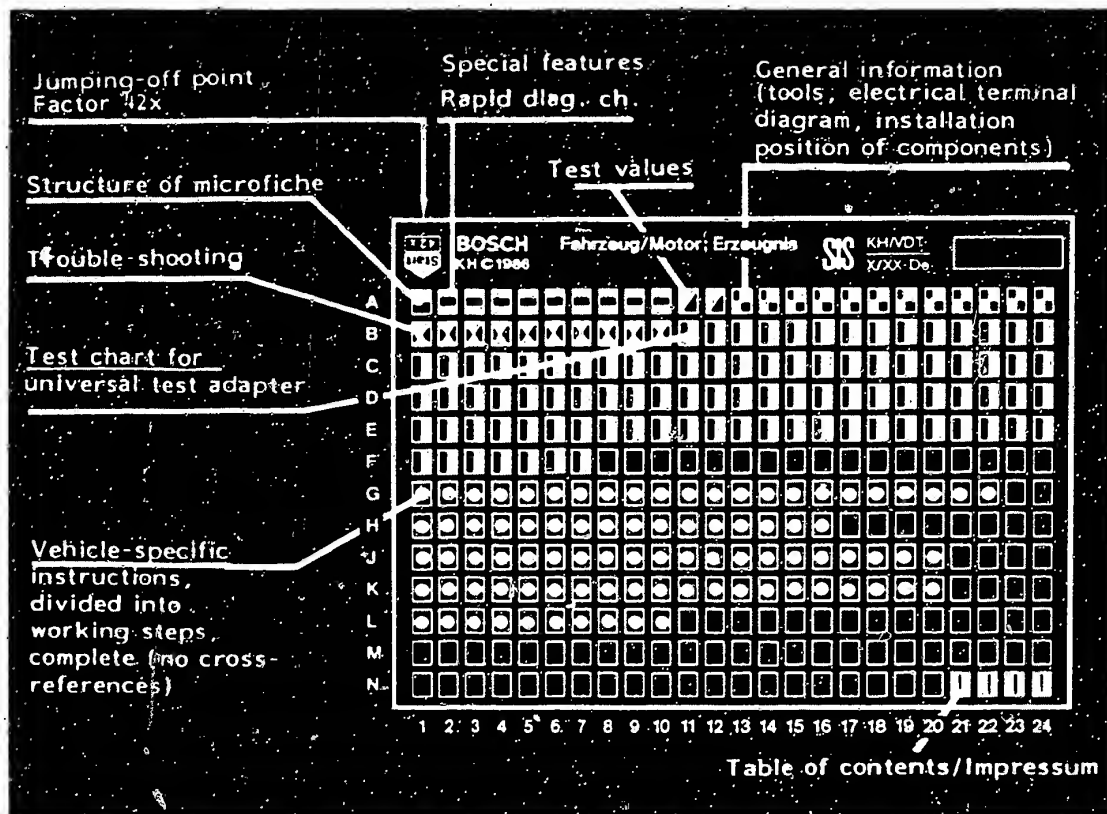


Structure of microfiche

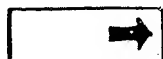


1. Read from left to right
2. Title of microfiche (appears on each coordinate)

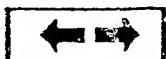
E 16	Product/component/test step
	Vehicle/engine

Coordinate

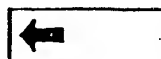
3. Limits of section



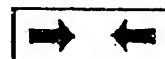
Beginning



Mid-section



End



One-page section

4. Purely vehicle-specific passages in the text are marked with a vertical bar.
5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

C6

A1	Trouble-shooting program	
-----------	--------------------------	--

This microcard contains the trouble-shooting instructions for the Motronic in the following ALFA ROMEO models valid at the time of writing:

- ALFA ROMEO Alfa 90 - 2.0 i (2.85 →)
2.0l /4 cyl. engine
and control unit no. 0 261 200 063

SPECIAL FEATURES

- For vehicles with control unit no. 0 261 200 040 or ... 044, the diagnosis chart from the SIS microcard ALF 500 must be used.
- Sweden/Switzerland version has been included.

1. RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER

The following rapid diagnosis chart makes it possible for the Motronic Specialist to rapidly check the electrical part of the system using the universal test adapter.











The rapid diagnosis chart contains the following information:

- Switch positions on the universal test adapter
- Test-step sequence
- Remarks on the operation of the universal test adapter and other components
- Readings on the multimeter and motortester
- References to coordinates of the respective detailed test and trouble-shooting program.

If detailed information and instructions are necessary, always proceed according to the trouble-shooting starting on Coordinate B1.



Rapid diagnosis chart for universal test adapter Alfa 90 with control unit 0 261 200 063

Test step	Switch position		Remarks	Test specifications (reading)	For trouble-shooting see Coordinate
	V	Ω			
1		1	Shift gear to neutral. Ignition off. Disconnect control unit. Measure insulation resistance of engine-speed sensor. Term. 8 against term. 5	Greater than 1M Ω	B 18
2		2	Measure insulation resistance of reference-mark sensor. Term. 25 against term. 5	Greater than 1M Ω	B 20
3		3	Measure winding resistance of engine-speed sensor. Term 8 against term 27	0.6...1.6 k Ω	B 22
4		4	Measure winding resistance of reference-mark sensor. Term. 25 against term 26	0.6...1.6 k Ω	C 3
5		5	Measure resistance of engine temperature sensor (NTC II - engine) Term. 13 against term 5	at 15° to 30°C: 1,3... 3,6 k Ω (depends on temperature)	C 8
6		6	Measure resistance of air temperature sensor (NTC I - air) Term. 22 against term. 5	at 15° to 30°C: 1,3... 3,6 k Ω (depends on temperature)	C 10
7		7	Measure resistance. Lead for map switch-over. Term. 10 against term. 5	General: greater than 1M Ω Sweden/Switzerland: less than 10 Ω	C 12
8		8	Deleted	---	---
9		9	Measure resistance of idle contact. Term. 2 to term. 5. Accelerator pedal at rest: Lightly depress accelerator pedal:	less than 10 Ω greater than 1 M Ω	C 14
10		10	Measure resistance of full-load contact. Term. 3 to term. 5. Fully depress accelerator pedal: Release accelerator pedal:	less than 10 Ω greater than 1 M Ω	C 17

A3

Rapid diag. ch. for univ. test adapter
Alfa Romeo Alfa 90



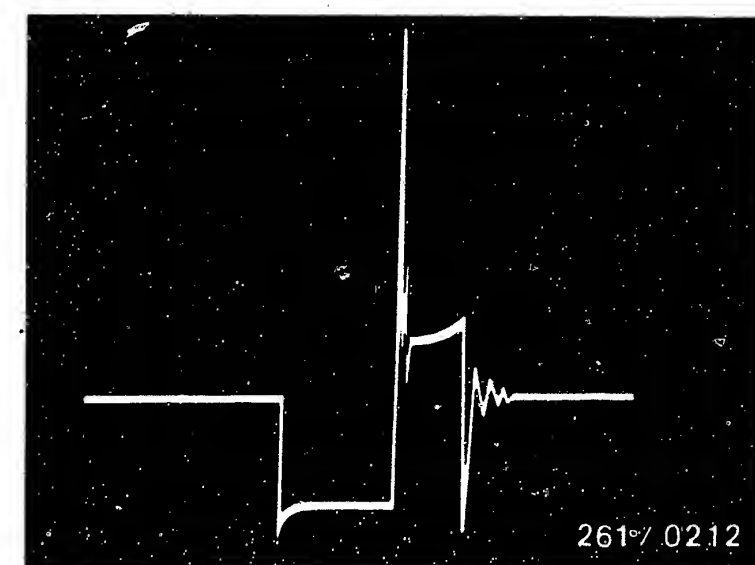
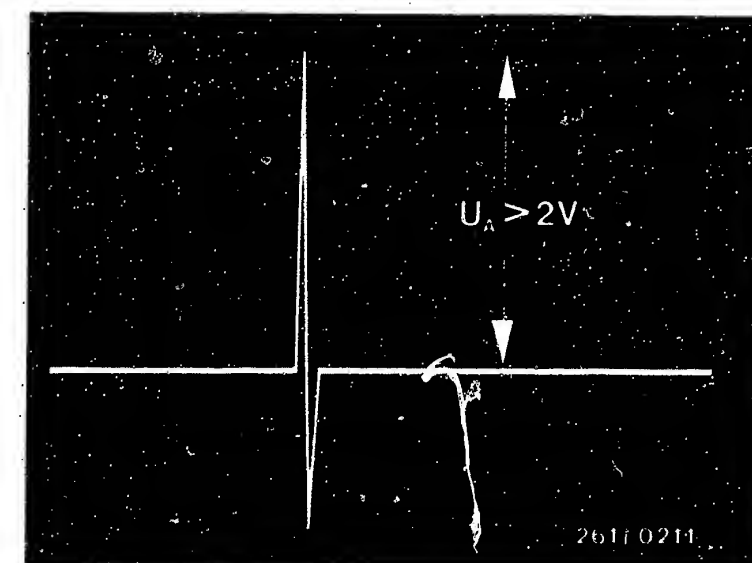
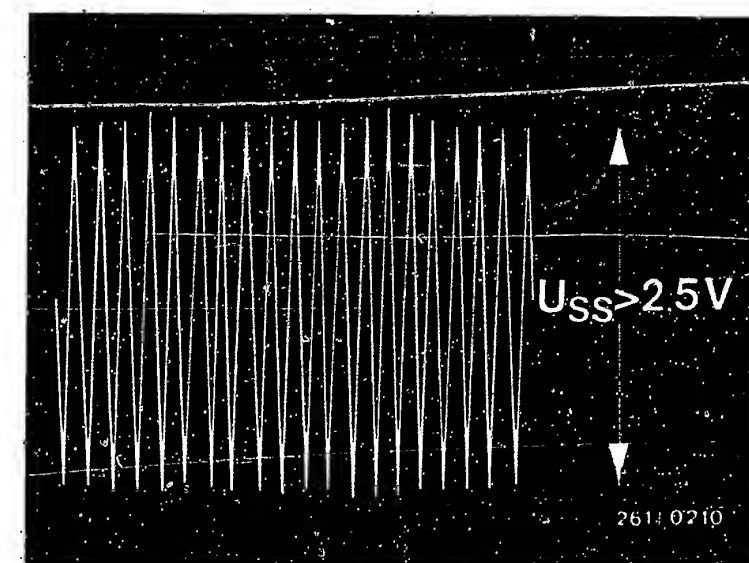
A4

Rapid diag. ch. for univ. test adapter
Alfa Romeo Alfa 90



Rapid diagnosis chart for universal test adapter (continued)

<u>Test step</u>	<u>Switch position</u>		<u>Remarks</u>	<u>Test specifications (reading)</u>	<u>For trouble shooting see Coordinates</u>
	V	Ω			
11	↓	11	Measure resistance. Ground term. 16 against term. 5	<u>Less than 10 Ω</u>	C 19
12	↓	12	Measure resistance. Ground term. 17 against term. 5	<u>Less than 10 Ω</u>	C 21
13	↓	13	Measure resistance. Ground term. 19 against term. 5	<u>Less than 10 Ω</u>	C 23
14	↓	14	Deleted	---	---
15		15	Deleted	---	---
16	1	15	Check signal with oscilloscope. Engine-speed sensor term. 8 against term. 27. Shift gear to neutral and crank engine.	<u>see upper illustration</u>	D 1
17	2	15	Check signal with oscilloscope. Reference-mark sensor term. 25 against term. 26. Shift gear to neutral and crank engine.	<u>see middle illustration</u>	D 7
18	3	15	Deleted	---	---
19	4	15	Deleted	---	---
20	6	15	Measure voltage at relay 2 (main relay). Term. 35 against term. 5. Switch on ignition.	<u>10 ... 15 V</u>	D 13
21	7	15	Deleted	---	---
22	5	15	Ignition off. Connect control unit. Measure ignition signal with oscilloscope. Control unit, ignition output stage term. 1 to term. 5. Disengage gear and start.	<u>see lower illustration</u>	D 15



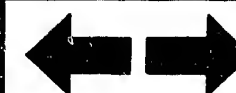
A5

Rapid diag. ch. for univ. test adapter
Alfa Romeo Alfa 90



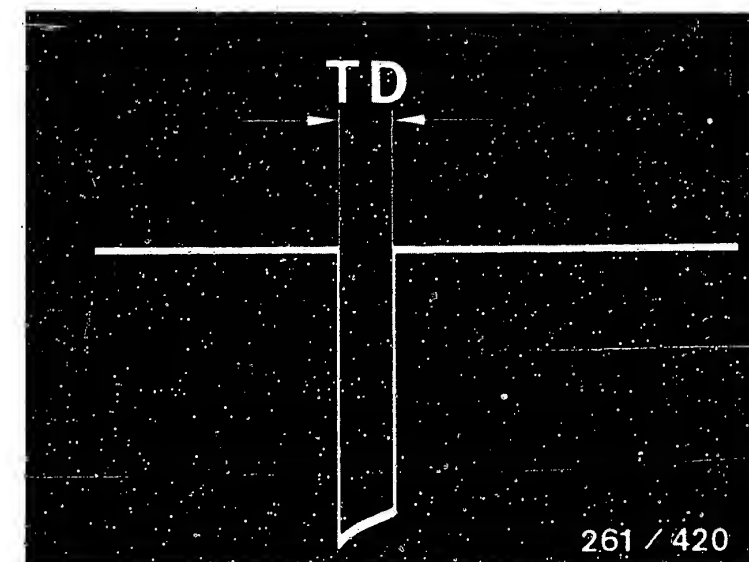
A6

Rapid diag. ch. for univ. test adapter
Alfa Romeo Alfa 90



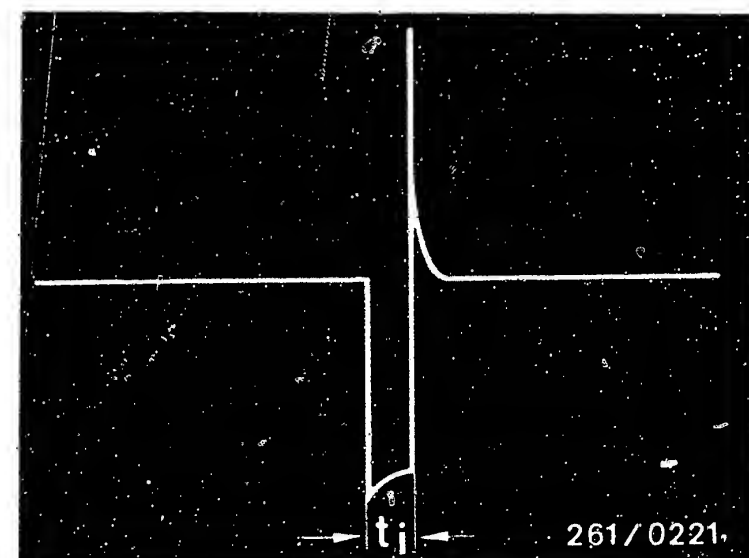
Rapid diagnosis chart for universal test adapter (Continued)

Test step	Switch position		Key	Remarks	Test specifications (reading)	Trouble-shooting see Coordinates
	V	Ω				
23	8	15		Measure voltage at control unit. Term. 9 to term. 5. Ignition on.	4.5...5.5 V	D 17
24	9	15		Measure voltage at air-flow sensor. Term. 7 to term. 5. Sensor flap at rest: Sensor flap fully open:	200...300mV greater than 4.2 V	
25	10	15		Not applicable	---	---
26	11	15		Not applicable	---	---
27	12	15		Measure voltage. Starting signal term. 50. Control unit term. 4 to term. 5	8 ... 15 V	D 21
28	13	15		Check dwell-period signal from control unit with oscilloscope. Term. 21 to term. 5. Disengage gear and start.	see upper illustration	D 23
29	14	15		Check ignition signal from control unit with oscilloscope. Term. 14 to term. 5. Disengage gear and start.		E 1
30	14	15	T1	As 29, except after pressing key (NTC II, cold) injection duration and engine speed somewhat increased.	see lower illustration	E 3
31	15	15		As test step 29, except term. 15 to term. 5		E 5
32	16	15		Check injection signal at test output using oscilloscope. Term. 11 to term. 5. Disengage gear and start.		E 7



Dwell-period signal
 t_s = Dwell period

Injection signal
 t_i = Duration of injection



A7

Rapid diagn. ch. for univ. test adapter
Alfa Romeo Alfa 90



A8

Rapid diagn. ch. for univ. test adapter
Alfa Romeo Alfa 90



Rapid diagnosis chart for universal test adapter (continued)

Test step	Switch position		Key	Remarks	Test specifications (reading)	Trouble-shooting, see Coordinates
	V	Ω				
33	17	15		Plug in pump relay. Measure voltage. Measure pump-relay actuation term. 20 to term. 5. Ignition on.	10 ... 15 V	E 9
34	17	15		Measure voltage. Disengage gear and start. Control unit, pump control active. Term. 20 to term. 5	max. 4 V	E 11
35	17	15	T3	Ignition off. Connect pressure gauge. Ignition "ON". Press key T3, read off fuel pressure.	2.8 ... 3.2 bar	E 13
36	17	15		Connect motortester. Connect CO tester. Let engine run to operating temperature. Check idle speed and CO.	850...950 min ⁻¹ 0.5...1.5 % CO	E 19
			T2	As above, values unchanged		
37	17	15		Let engine run. Check spark advance and idle speed. Important! Idle speed must be between 850...950 min ⁻¹ ; otherwise, another spark advance will be shown! Note: For Sweden/Switzerland version term. 10 to ground.	general: 5°...15° Sweden/ Switzerland: -5°...+5°	E 23
			T6	Check spark advance at full load. Engine at operating temperature. Set engine speed to 2600 min ⁻¹ , then depress T6 (full-load key) and if necessary correct engine speed again to 2600 min ⁻¹ .	13°...23° at engine speed 2600 min ⁻¹	
38	17	15		Dwell angle (measured at ignition coil) at idle speed	8°...18°	F 1
				Dwell angle at 3000 min ⁻¹	25°...45°	
39	17	15	T5	Keep engine speed constant at 2000 min ⁻¹ . Press key T5. Injection signals go off and come back on again at approx. 900...1200 min ⁻¹ .	Engine "surges"	F 3
40	20	15		Measure voltage at relay 3 (camshaft actuation) between term. 31 and term. 5. Idle speed.	10 ... 15 V	
			T6	Set engine speed to 2000...3000 min ⁻¹ and press key T6. (At idle speed press key T6: engine runs unevenly or cuts off)	max. 4 V	

A9

Rapid diag. ch. for univ. test adapter
Alfa Romeo Alfa 90



A10

Rapid diag. ch. for univ. test adapter
Alfa Romeo Alfa 90



2. TEST SPECIFICATIONS

The resistance figures are without test adapter.

<u>Idle speed</u>	<u>850...950 min⁻¹</u>	H15
<u>Exhaust adjustment</u> CO concentration with engine at operating temperature:	<u>0.5...1.5 vol%CO</u>	
<u>Fuel pressure</u>	<u>2.8...3.2 bar</u>	K11
<u>Fuel-pump delivery:</u>	<u>min. 750 cm³/30 s</u>	K15
<u>Solenoid-operated injection valve</u> Electrical internal resistance at +20°C:	<u>15 ... 17.5 Ω</u>	G3
<u>Air-flow sensor</u> Resistance between term. 7 and term. 6:	<u>8 Ω ... 2500 Ω</u> (deflect sensor flap)	
Term. 9 and term. 6	<u>500 Ω ... 1100 Ω</u>	
<u>Auxiliary-air device</u> Electrical internal resistance	<u>25 ... 60 Ω</u>	G9

See equipment and autodata microcard for setting values for ignition, valve play, and other technical engine data.



Temperature sensor (NTC I air):

Electrical internal resistance

at + 15° C...+30°C:

measured at air-flow

sensor between terminals

22 and 6: 1,3...3,6 Ω

C10

Temperature sensor II (NTC II-engine)

Electrical internal resistance

at + 15°C...+30°C: 1,3... 3,6 k Ω

at + 80°C: 250...390 Ω

C8

Engine-speed sensor and reference-mark sensor

Electrical internal

resistance 0.6...1.6 k Ω

B18

Throttle-valve switch

Resistance of idle

contacts (terminals 2 and
43): 0 Ω

Full-load contacts

(terminals 3 and 43): 0 Ω

C14

Solenoid-operated valve

for camshaft energization

Electrical internal

resistance approx. 12 Ω

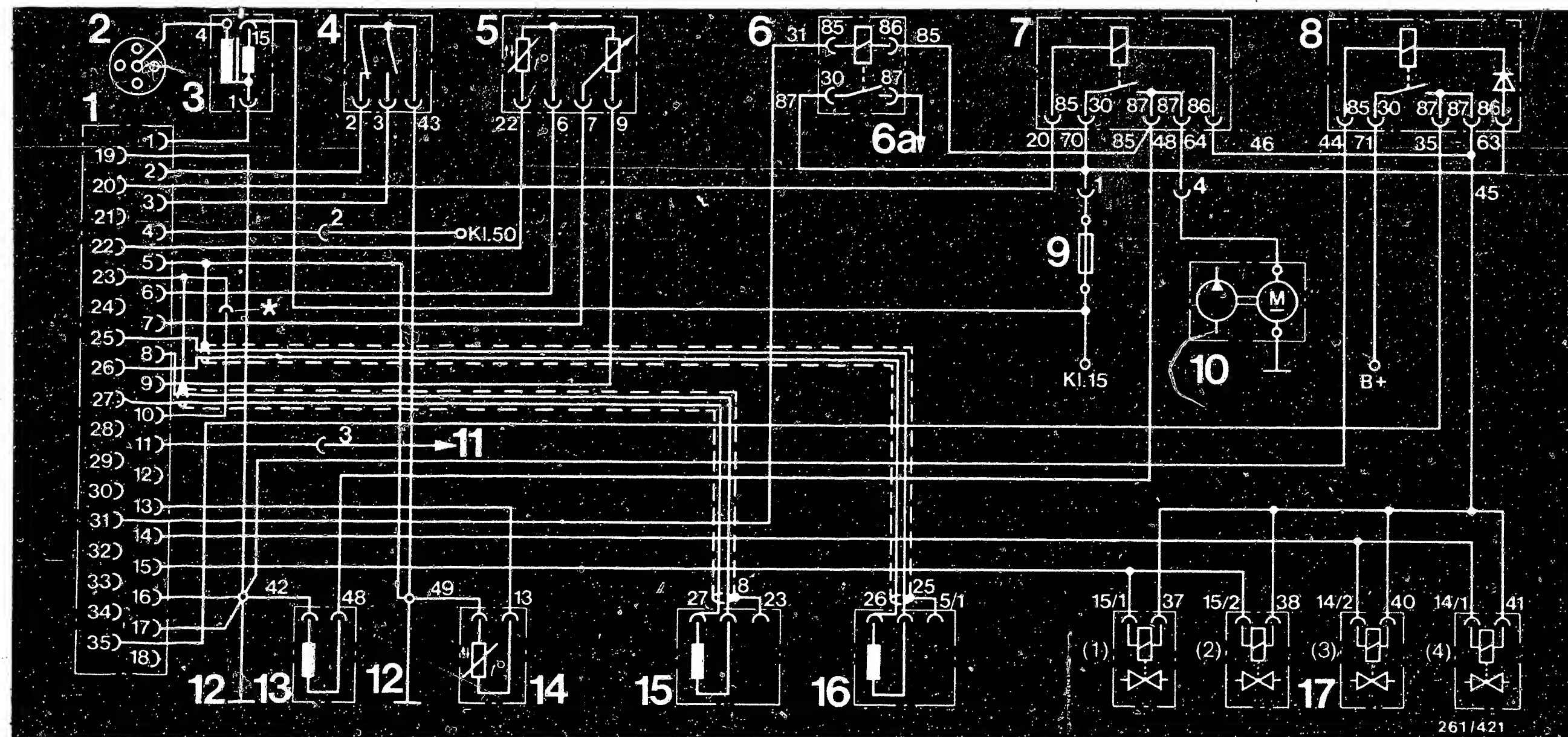
J9

A12

Test specifications

Alfa Romeo Alfa 90





3. ELECTRICAL TERMINAL DIAGRAM

- 1 = Control unit plug (35 pin)
- 2 = High-voltage distributor
- 3 = Ignition coil
- 4 = Throttle-valve switch
- 5 = Air-flow sensor with NTC I
- 6 = Relay 3 (camshaft energization)

- 6a = To solenoid-operated valve
- 7 = Relay 1 (pump relay)
- 8 = Relay 2 (main relay)
- 9 = Fuse No. 22
- 10 = Fuel pump
- 11 = To consumption meter (test output t_i)

- 12 = Ground terminals on auxiliary-air device and inlet valve cover
- 13 = Auxiliary-air device
- 14 = Temperature sensor (NTC II-engine)
- 15 = Engine-speed sensor
- 16 = Reference-mark sensor
- 17 = (1, 2, 3, 4) = injection valves Cyl. 1, 2, 3, 4

* plugged for Switzerland version

A13

Electrical terminal diagram

Alfa Romeo Alfa 90

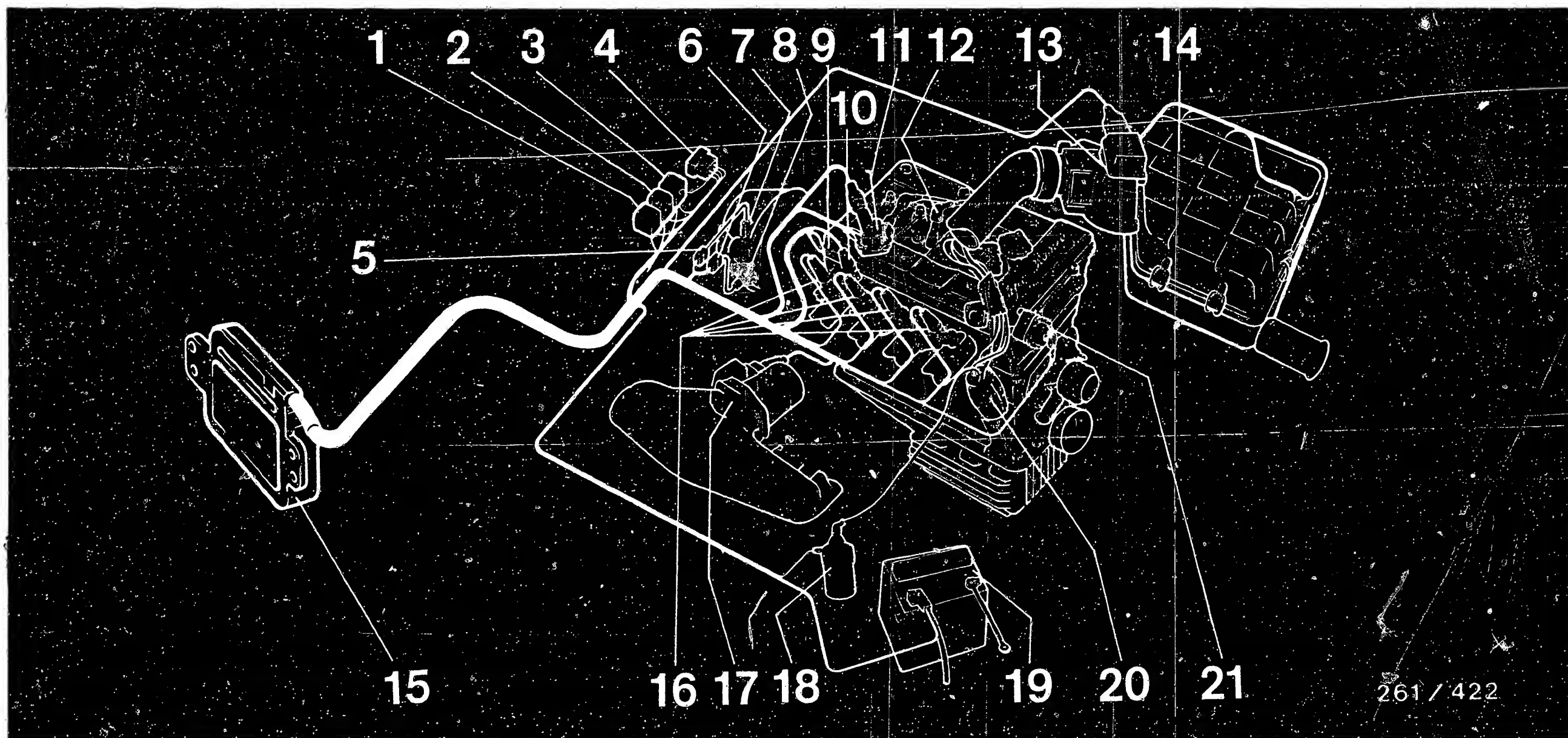


A14

Electrical terminal diagram

Alfa Romeo Alfa 90





261 / 422

4. ELECTRICAL WIRING DIAGRAM

- 1 = Relay 1 (pump relay)
- 2 = Relay 2 (main relay)
- 3 = Relay 3 (camshaft energization)
- 4 = Plug-in connection to vehicle wiring harness
- 5 = Plug-in connection for engine-speed sensor
- 6 = Plug-in connection for reference-mark sensor
- 7 = Engine-speed sensor

- 8 = Reference-mark sensor
- 9 = Ground terminals
- 10 = Temperature sensor (NTC II-engine)
- 11 = Auxiliary-air device
- 12 = Spark plug
- 13 = Air-flow sensor
- 14 = Air filter
- 15 = Control unit
- 16 = Solenoid-operated injection valves

- 17 = Throttle-valve switch
- 18 = Ignition coil
- 19 = Battery
- 20 = High-voltage distributor
- 21 = Solenoid operated valve for camshaft energization

A15

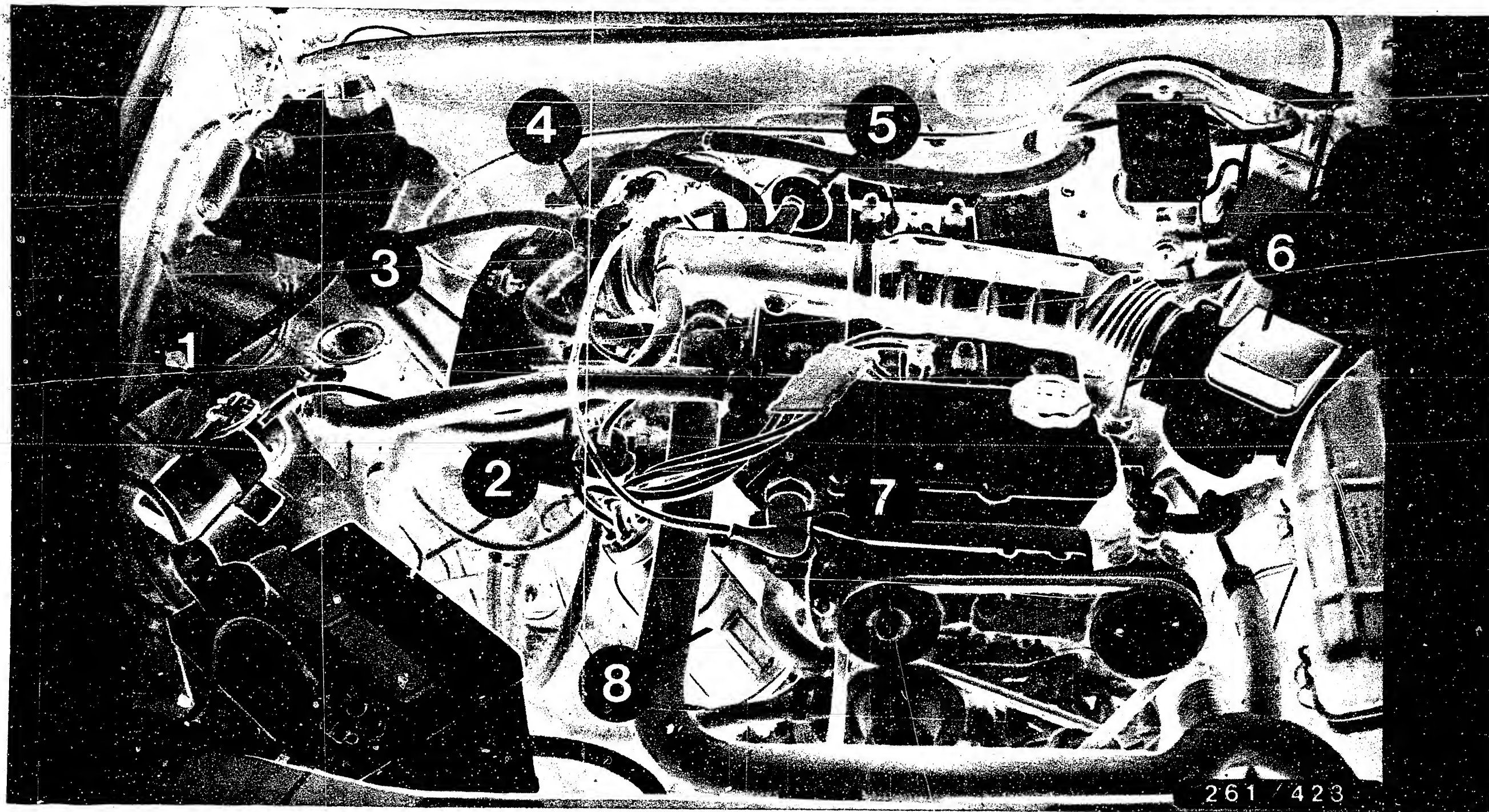
Electrical wiring diagram
Alfa Romeo Alfa 90



A16

Electrical wiring diagram
Alfa Romeo Alfa 90





5. INSTALLATION POSITION OF COMPONENTS

1 = Ignition coil
2 = Pressure regulator
3 = Intake manifold

4 = Throttle-valve switch
5 = Auxiliary-air device
6 = Air-flow sensor

7 = Electromagnet for camshaft
actuation
8 = High-voltage distributor

A17

Installation position of components
Alfa Romeo Alfa 90



A18

Installation position of components
Alfa Romeo Alfa 90



Installation position of component, (Continued)

Installation position information is always with reference to the direction of travel. In the following, components are listed which are not visible in the illustration.

Reference-mark and engine-speed sensor:

In the starting-motor ring gear housing on the outside circumference of the flywheel ring gear.

Control unit:

On the right A-post behind a plastic covering.

Temperature sensor I (air):

In air-flow sensor.

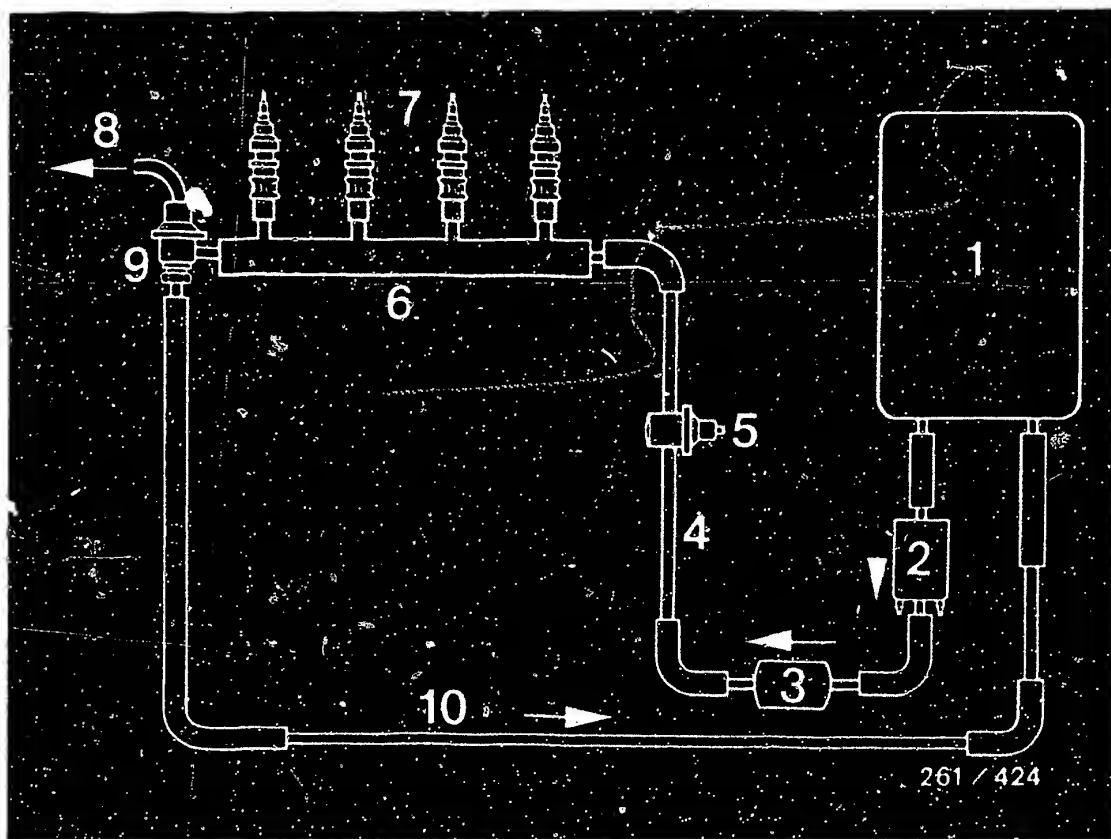
Temperature sensor II (engine):

On the right side of the engine, between cyls. 3 and 4. Blue plug.

Central ground terminals:

1. Underneath the auxiliary-air device fastening bolts.
2. Underneath one of the bolts for the intake-valve cover, near the injection valve on the 4th cylinder.





6. FUEL LINE DIAGRAM

- 1 = Fuel tank
- 2 = Fuel pump
- 3 = Fuel filter
- 4 = Fuel delivery line
- 5 = Fuel-line-pressure damper
- 6 = Fuel-distribution pipe
- 7 = Solenoid-operated injection valves
- 8 = To intake manifold
- 9 = Pressure regulator
- 10 = Fuel return line



7. TEST EQUIPMENT AND TOOLS

<u>Description</u>	<u>Designation</u>	<u>Part No.</u>
Universal test adapter Adapter cable	ETT 018.01	0 684 101 801 1 684 463 124
Motortester	e.g. MOT 002.00 or 200	0 684 000 200
Exhaust-gas analyzer	e.g. ETT 008.02 or ETT 008.03	0 684 100 802 0 684 100 803
Multimeter (analog reading, internal resistance min. 20 k Ω /V)		Commercially available e.g. type MA 2H from Metrawatt or Fluke Multimeter 75 or 77
Pressure gauge 6 bar or Pressure tester or Pressure tester (no longer available) Three-way line as connection piece for KDJE-P100 and KDEP 1034	Quality class 1.0 0.1 bar graduations	1 687 231 154 KDJE-P 100 KDEP 1034 KDJE-P100/13



<u>Description</u>	<u>Part No.</u>
Feeler gauge for measuring the sensor air gaps (up to 1 mm)	Commercially available
Lubricant for engine-speed and reference- mark sensors	Molykote Longterm 2, commercially available
Chassis dynamometer e.g. LPS 96 or LPS 002	0 680 017 001 0 680 100 200
Electric connecting cable (test lead) for direct connection of the components under test, e.g. injection valves	KDJE 7450/70



8. IMPORTANT GENERAL INFORMATION

This information must be observed in order to prevent damage to the engine, control unit or ignition coil and for the safety of personnel.

1. Never start engine without securely connected battery.
2. Incorrect polarity of the supply voltage, e.g. by incorrect connection of the battery or ignition coil, can lead to irreparable damage to the control unit.
3. Do not use a fast charger for starting the engine.

Use only a second 12 V battery and jump leads.

Caution! Owing to different requirements of vehicle manufacturers with regard to electronic products we advise you not to use 24 V batteries as an aid for starting. Follow the vehicle owners manual.

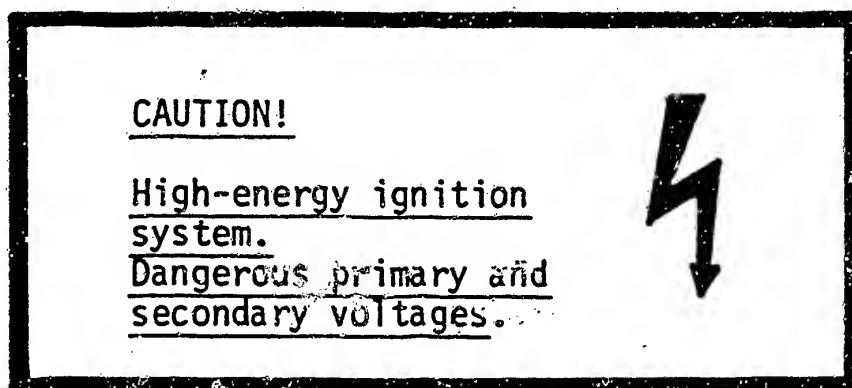
4. Disconnect the battery from the vehicle electrical system before fast charging.
5. When charging the battery in the vehicle or when using a starting aid, follow the information in the operating instructions of the fast charger and also follow the information given by the vehicle manufacturer.
6. Never disconnect the battery from the vehicle electrical system with the engine running.
7. Do not short-circuit ignition coil term. 1 to ground (e.g. for stopping the engine). The ignition coil and possibly the control unit will suffer irreparable damage.
8. Never bring the positive pole of the battery into contact with ignition coil term. 1. The control unit will suffer irreparable damage.



9. Never connect or disconnect the wiring-harness plug of the control unit with the ignition switched on.
10. Remove the control unit at temperatures above 80°C (paint-drying installation).
11. Remove the control unit before performing welding work (electric spot welding).
12. Remove the relay combination when performing a compression test. This prevents undesired injecting of the injection valves.
13. When installing an alarm system observe the information in the installation instructions for Motronic vehicles or the SIS microcard ALL-500.

It must be ensured that the alarm relay does not suffer interference from stray fields (e.g. from H.T. ignition cables), causing it to trip incorrectly.

14.



Contact with voltage-carrying parts or terminals can be extremely hazardous or fatal (on the primary as well as secondary side).



9. TROUBLE-SHOOTING

The following trouble-shooting programs are designed to enable the workshop employees using the Universal test adapter and other suitable testers to quickly detect causes of trouble on the Motronic.

Depending on the level of training and experience of the mechanic a choice can be made between the following procedures:

- Detailed, step-by-step trouble-shooting program for employees with little practice or experience on Motronic vehicles.
- Pin-pointed, direct trouble-shooting chart for trained, experienced employees with a great deal of practice on Motronic vehicles.

B3**B5**

Both trouble-shooting charts start by checking the electrical/electronic part of the Motronic using the Motronic test adapter ETT 018.01. This makes it possible within a short space of time to check the electrical operation of the wiring harness with the connected components (including control unit) and to quickly locate faults.

If no fault is found using the Motronic test adapter, continue with the detailed or the direct trouble-shooting chart program.

B1

Trouble-shooting chart

Alfa Romeo Alfa 90

**B2**

Trouble-shooting chart

Alfa Romeo Alfa 90



9.1 Detailed, step-by-step trouble-shooting

- Test with Motronic test adapter

This test must come at the start of the test program and must be performed from beginning to end (Coordinates B11...F7).

- Trouble-shooting according to customer complaints (fault symptoms)

The table below contains possible fault symptoms and the right-hand column gives the first coordinate of the respective detailed trouble-shooting program.

The trouble-shooting program consists of logically ordered test steps for all individual components of the Motronic. If, after completing the trouble-shooting program for an assumed symptom, the fault has not been located or remedied, choose a new fault symptom and work through the respective program.

<u>Customer complaints (fault symptom)</u>	<u>Test with test adapter</u>	<u>Coordinates</u>
1. Engine fails to start or starts only with great difficulty	B 11	G 1
2. Engine starts but then dies	B 11	G 15
3. Uneven engine idle	B 11	H 1
4. Poor throttle take-up	B 11	J 1
5. Engine missing under all operating conditions	B 11	J 11
6. Fuel consumption too high	B 11	K 1
7. No maximum engine power	B 11	K 7
8. CO concentration at idle too high or too low	B 11	L 1

B3

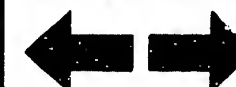
Trouble-shooting chart

Alfa Romeo Alfa 90

**B4**

Trouble-shooting chart

Alfa Romeo Alfa 90



9.2 Pin-pointed, direct trouble-shooting

• Test with Motronic test adapter

The test with the test adapter must come at the start of the test program and must be performed from beginning to end. (Coordinates B11...F7).

• Trouble-shooting according to customer complaints

The table below contains various fault symptoms with several possible causes of the fault in each case. The references given on the left indicate the first coordinate of the test step for the respective individual component of the Motronic. If, after testing the individual components, the fault has not been located or remedied, it is necessary to choose a new fault symptom.

Customer complaint (fault symptoms)

1. Engine fails to start or starts only with great difficulty

2. Engine starts but then dies

3. Uneven engine idle, idle speed incorrect

4. Poor throttle take-up

5. Engine missing under all operating conditions

6. Fuel consumption too high

7. No maximum engine power

8. CO concentration at idle too high or too low

Cause (component fault)

B11	B11	B11	B11	B11	B11	B11	B11	Test with Motronic test adapter
●*)								Relay 1 or 2 (main relay or pump relay) defective
●*)								Electric fuel pump not operating
G9	G19		J7					Auxiliary-air device not opening
		H7						Auxiliary-air device not closing
G11	G21	H3	J5	J17	K5	K13	L3	Air-flow sensor defective

B5

Trouble-shooting chart

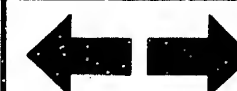
Alfa Romeo Alfa 90



B6

Trouble-shooting chart

Alfa Romeo Alfa 90



Customer complaints (fault symptoms)

1. Engine fails to start or starts only with great difficulty

2. Engine starts but then dies

3. Uneven engine idle, idle speed incorrect

4. Poor throttle take-up

5. Engine missing under all operating conditions

6. Fuel consumption too high

7. No maximum engine power

8. CO concentration at idle too high or too low

Cause (component fault)

G11	G17	H5	J5				L7	Air-intake system leaking
G5								Solenoid-operated injection valves defective
●*)		●*)				K11		Fuel pressure too low or zero; pressure regulator not operating
		●*)			●*)		●*)	Fuel pressure too high; pressure regulator not operating
				J15				Fuel delivery too low
	●*)				●*)		●*)	Temperature sensor I (air) or temperature sensor II (coolant) defective
						K9		Throttle valve not opening fully
				J13				Poor central ground, loose contacts, faulty plug-in connections
G11	G17	H5	J5			K17	L7	Open circuit in wiring harness and plug-in connections
		●*)				●*)		Throttle-valve switch defective
		H15					L9	CO exhaust-gas setting too rich, idle adjustment
		H15	●*)				L9	CO exhaust-gas setting too lean, idle adjustment
		H13	J9		K3	K17	L5	Relay for camshaft energization defective
			J9			K19		Solenoid-operated valve for camshaft energization defective

B7

Trouble-shooting chart

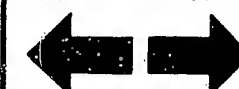
Alfa Romeo Alfa 90



B8

Trouble-shooting chart

Alfa Romeo Alfa 90



Customer complaints (fault symptoms)

1. Engine fails to start or starts only with great difficulty								
2. Engine starts but then dies								
3. Uneven engine idle, idle speed incorrect								
4. Poor throttle take-up								
5. Engine missing under all operating conditions								
6. Fuel consumption too high								
7. No maximum engine power								
8. CO concentration at idle too high or too low								
Cause (component fault)								
●*)							Engine-speed sensor defective	
●*)							Reference-mark sensor defective	
			J19				Alternator, check interference-suppression devices	
G3		H3	J3	J13	K3	K9	L3	Check secondary-circuit oscilloscope display
●*)	●*)	●*)	●*)	J15	●*)	●*)	●*)	Control unit defective

●*) If you have performed the test with Motronic test adapter, this component has already been tested. Continue testing with the next component in this column.
 However, if you have arrived at this point through a component complaint or through the test-specifications table, you must test this component with the Universal test adapter. The test program for the test adapter begins on Coordinate B11 and must be performed from beginning to end.



10. TEST WITH UNIVERSAL TEST ADAPTER ETT 018.01
(0 684 101 801) and adapter cable for Motronic

Connect the Motronic test adapter to the Motronic wiring harness (ignition must be off).

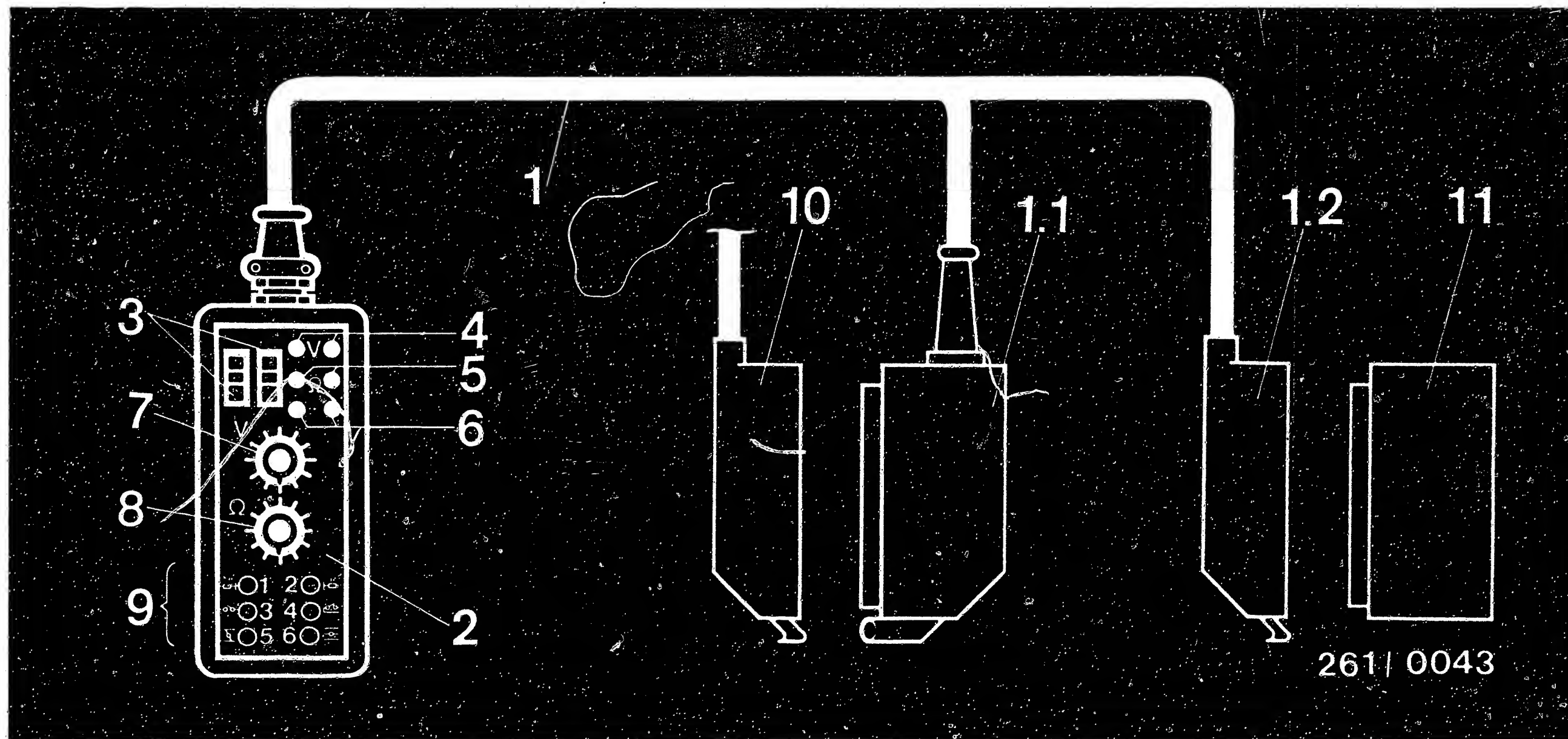
For testing the wiring harness and the connected components, only the Motronic wiring harness must be connected - but not the control unit. Be sure to observe the instructions in the test chart!

A pointer instrument for the voltage and resistance measurements (multimeter) as well as the motortester must be connected to the test adapter in order to make the measurements.

The individual test steps are selected with the program selector switch. The symbols V and Ω show the operator whether voltage or resistance is being measured. Some switch positions are necessary for simulation of operating conditions with engine running. By pressing the pushbuttons it is possible, with the control unit connected and the engine running, to simulate given operating conditions. Thus, for example, with the engine at normal operating temperature it is possible by pressing the push-button T1 to make the control unit "think" that the engine temperature is -20°C . It is then possible to evaluate the reaction of the control unit on the motor-tester.

If necessary, the circuit diagram can be used for trouble-shooting.





Universal test adapter with Motronic adapter cable

- 1 = Adapter lead
- 1.1 = Connection to wiring harness
- 1.2 = Connection to control unit
- 2 = Universal adapter (Part No.: 0 684 001 801)
- 3 = Test wells (for motortester)
- 4 = Test sockets (for voltage measurement)
- 5 = Test sockets (for resistance measurement)
- 6 = Test sockets (not occupied)
- 7 = Program switch "V"
- 8 = Program switch "Ω"

- 9 = Button panel for simulation of operating conditions
- 10 = Motronic wiring harness
- 11 = Control unit
- Button 1 = NTC II (engine), cold (-20° C)
- Button 2 = NTC II (engine), warm (+80° C)
- Button 3 = Pump energization
- Button 4 = Not occupied
- Button 5 = Throttle-valve idle contact
- Button 6 = Throttle-valve full-load contact

B 12

Testing with universal test adapter

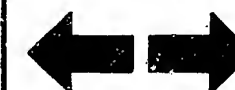
Alfa Romeo Alfa 90

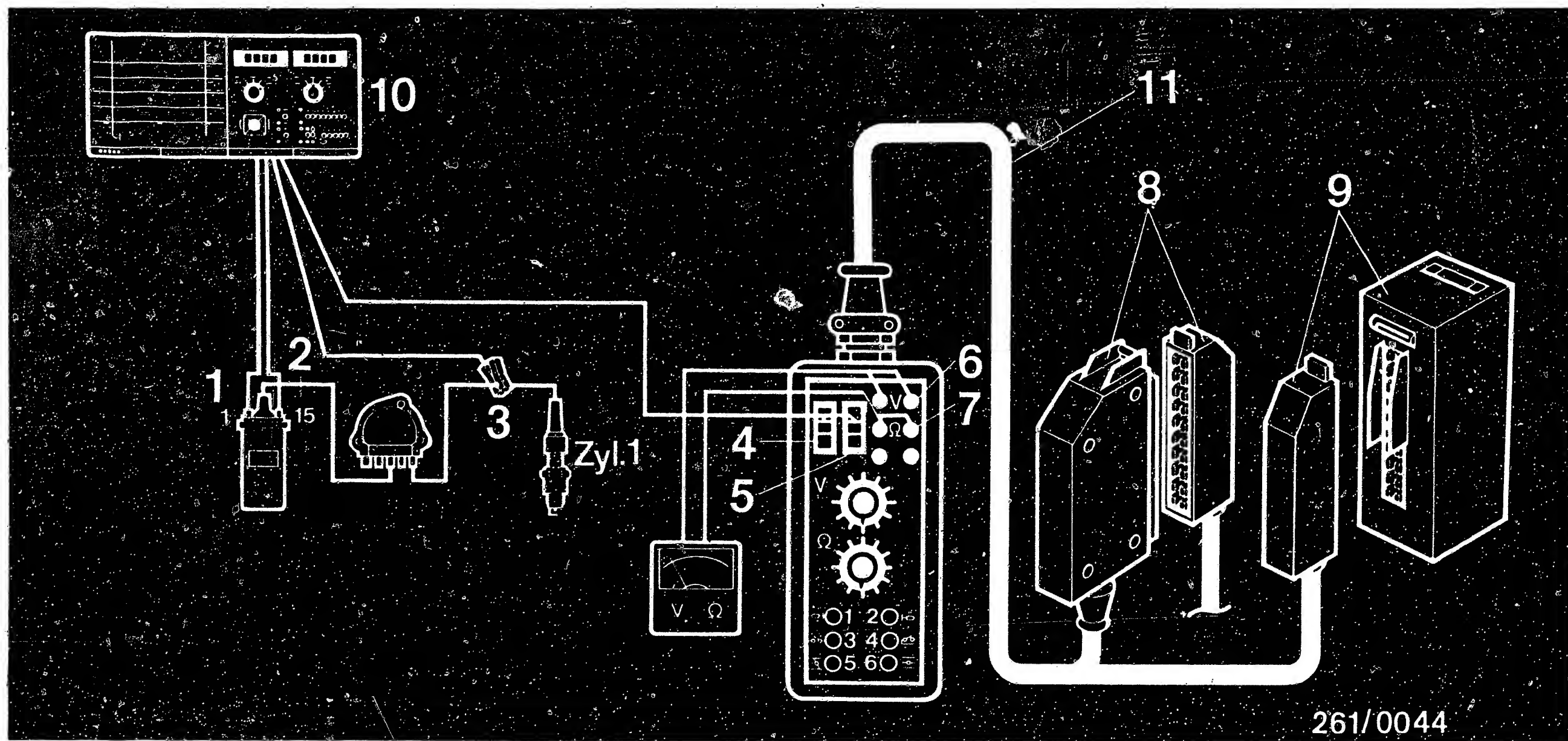


B 13

Testing with universal test adapter

Alfa Romeo Alfa 90





9.3 Connection diagram for universal test adapter

- | | |
|--|--|
| 1 = Green clip to ignition coil term. 1 | 6 = Connection of voltmeter to V sockets (red = +, black = ground or negative) |
| 2 = Yellow clip to ignition coil term. 15 | 7 = Connection of ohmmeter to black Ω sockets (blue) |
| 3 = Induction-type clamp-on pickup over H.T. ignition cable of cylinder 1 | 8 = Connection to Motronic wiring harness |
| 4 = Red connection socket (test well) for red terminal of motortester | 9 = Connection to Motronic control unit |
| 5 = Black connection socket (test well) for black terminal of motor tester | 10 = Motortester |
| | 11 = Adapter cable for Motronic |

B14

Testing with universal test adapter
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B15

Testing with universal test adapter
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Preparations for test with universal test adapter

Remove the control unit and connect the test adapter.

Installation position of control unit: on the right A-post behind a plastic cover (see upper illustration).

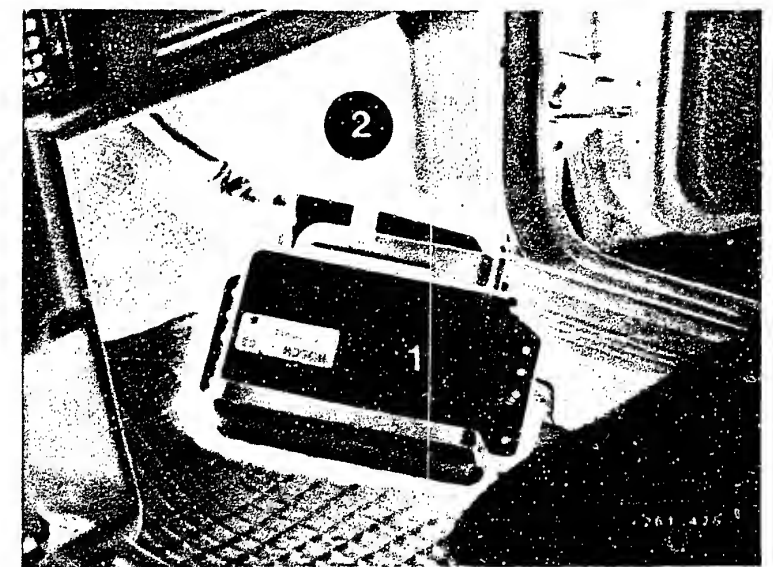
In order to remove the control unit plug, the plug catch must be pushed back, the plug turned upwards in the direction of the arrow, and disengaged.

Note

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.

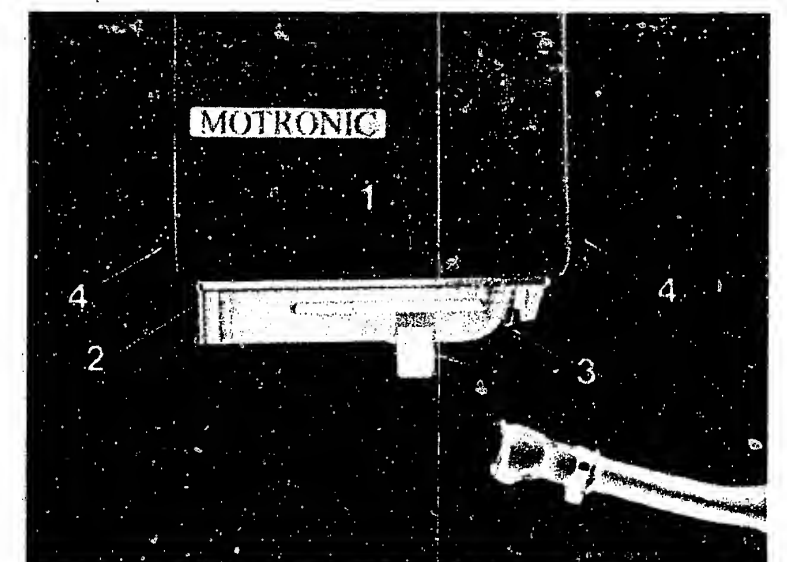
Note:

In the following test steps, the column "operation" has a white border to show which operation has to be changed compared with the previous operation.



- 1 = Control unit
- 2 = Plastic cover

- 1 = Control unit
- 2 = Locating lug
- 3 = Detent
- 4 = Fastening holes



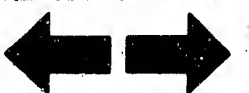
B 16

Testing with universal test adapter
Alfa Romeo Alfa 90




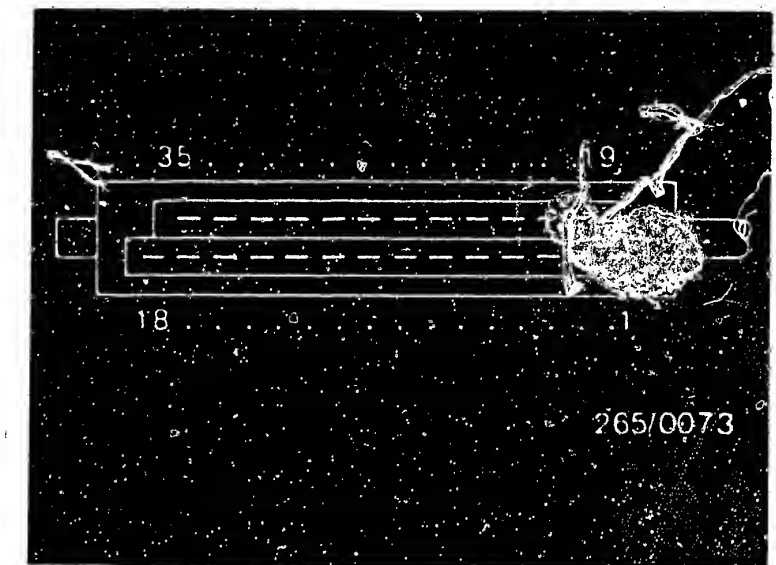
B 17

Testing with universal test adapter
Alfa Romeo Alfa 90



Test step 1: Switch off ignition. Disconnect control unit.

<u>Operation</u>		<u>Reading</u>	<u>Testing</u>
<u>Program switch "V"</u> <u>at position:</u>		Multimeter must indicate <u>greater than 1 M Ω</u> If reading OK, continue testing with <u>next test</u> <u>step.</u>	<u>Component:</u> Engine-speed sensor
<u>Program switch "Ω"</u> <u>at position:</u>	1		
<u>Measuring equipment:</u> Multimeter (Ω range)			<u>Operation:</u> Insulation between Term. 8 and ground
<u>Measuring range:</u> 10 M Ω			
<u>Connection:</u> Test sockets	Ω		<u>Malfunction:</u> Resistance less than 1 M Ω
<u>Operation in vehicle:</u> Switch off ignition			



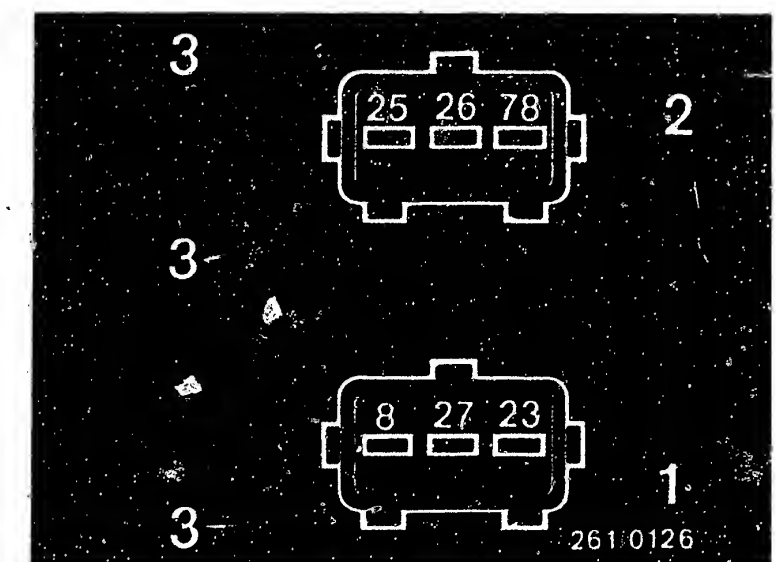
Top view of 35-pin control unit plug

- 1 = Connector for engine-speed sensor
- 2 = Connector for reference-mark sensor (marked)
- 3 = Locating lugs

Trouble-shooting:

Resistance reading approx. 0 Ω :
Check lead 8 for short circuit to ground.

Resistance reading 0.6 ... 1.6 k Ω :
Check lead 27 for short circuit to ground.



B 18

Testing with universal test adapter
Alfa Romeo Alfa 90



B 19

Testing with universal test adapter
Alfa Romeo Alfa 90

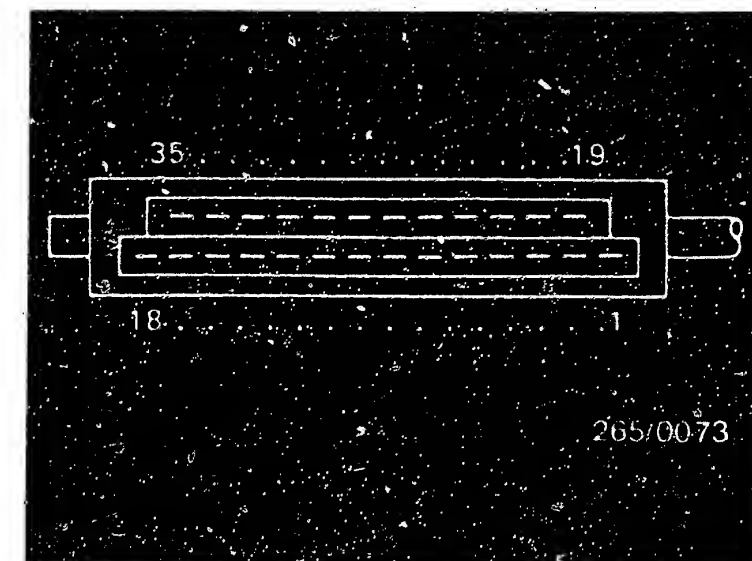


Test step 2		
Operation	Reading	Testing
<div>Program switch "V" at position:</div> <div>↓</div>	Multimeter must indicate greater than 1 M Ω	<u>Component:</u> Reference-mark sensor
<div>Program switch "Q" at position:</div> <div>2</div>		
<u>Measuring equipment:</u> Multimeter (Ω range)	If reading OK, continue testing with next test step.	<u>Operation:</u> Insulation between Term. 25 and ground
<u>Measuring range:</u> 10 M Ω		
<u>Connection:</u> Test sockets		<u>Malfunction:</u> Resistance less than 1 M Ω
<u>Operation in vehicle:</u> Switch off ignition.		

Trouble-shooting:

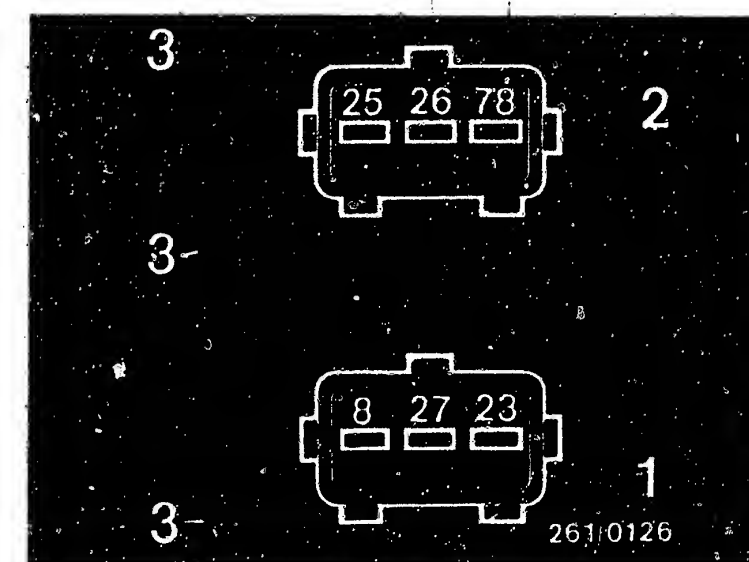
Resistance reading approx. 0 Ω :
Check lead 25 for short circuit to ground.

Resistance reading 0.6...1.6 k Ω :
Check lead 26 for short circuit to ground.



Top view of 35-pin control unit plug

- 1 = Connector for engine-speed sensor
- 2 = Connector for reference-mark sensor (marked)
- 3 = Locating lugs



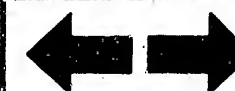
B20

Testing with universal test adapter
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B21

Testing with universal test adapter
Alfa Romeo Alfa 90



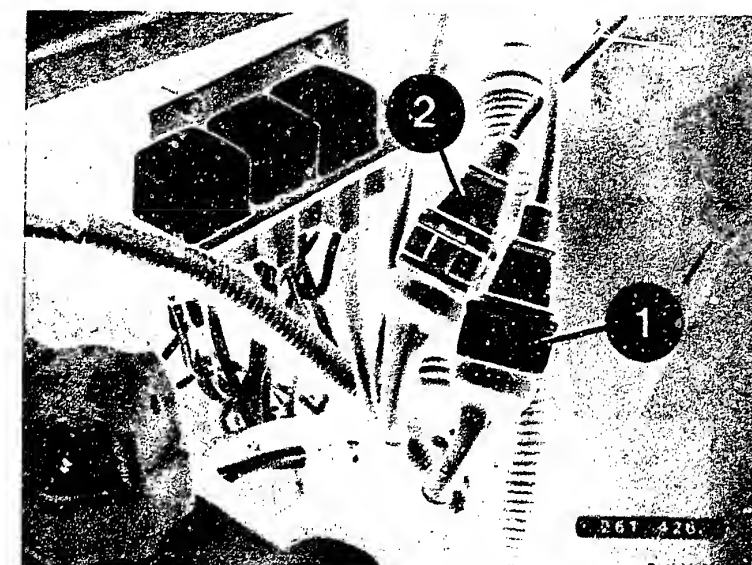
Test step 3			
Operation		Reading	Testing
Program switch "V" at position:	↓	Multimeter must indicate 0.6...1.6 k Ω	Component: Engine-speed sensor
Program switch "Ω" at position:	3		Operation: Winding resistance between Term. 8 and Term. 27
Measuring equipment: Multimeter (Ω range)			Malfunction: Resistance outside tolerance
Measuring range: 0 to 10 k Ω			
Connection: Test sockets	Ω		
Operation in vehicle: Switch off ignition			

Trouble-shooting:

- Repeat measurement directly at sensor plug.
- Check plug-in connection: Corrosion, loose contact (spring contacts must not allow themselves to be pushed back)
- Check leads from engine-speed sensor term. 8 and term. 27 to control unit plug term. 8 and term. 27.
- Replace sensor.

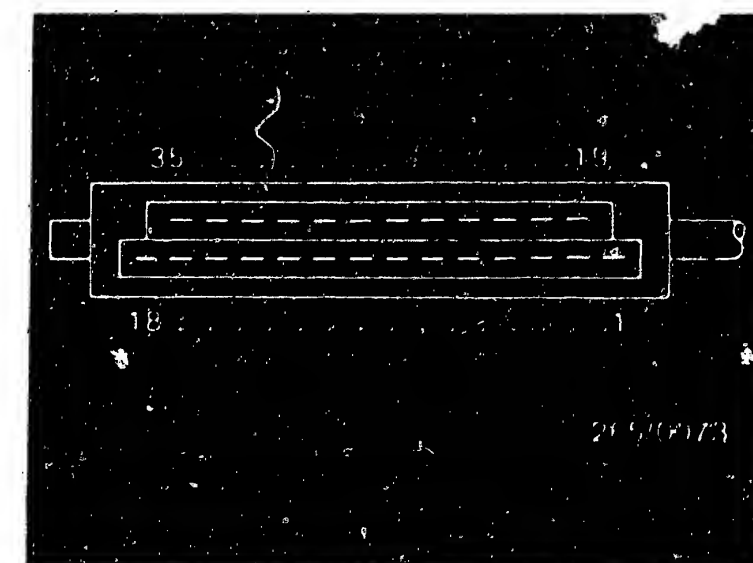
To replace the sensors, undo the plug-in connection and unscrew the hexagon-socket-head cap screw on the sensor. Remove dirt deposits on the sensor. If necessary, apply two screwdrivers to the recesses to left and right of the sensor and raise the sensor. Caution! Do not loosen the mounting.

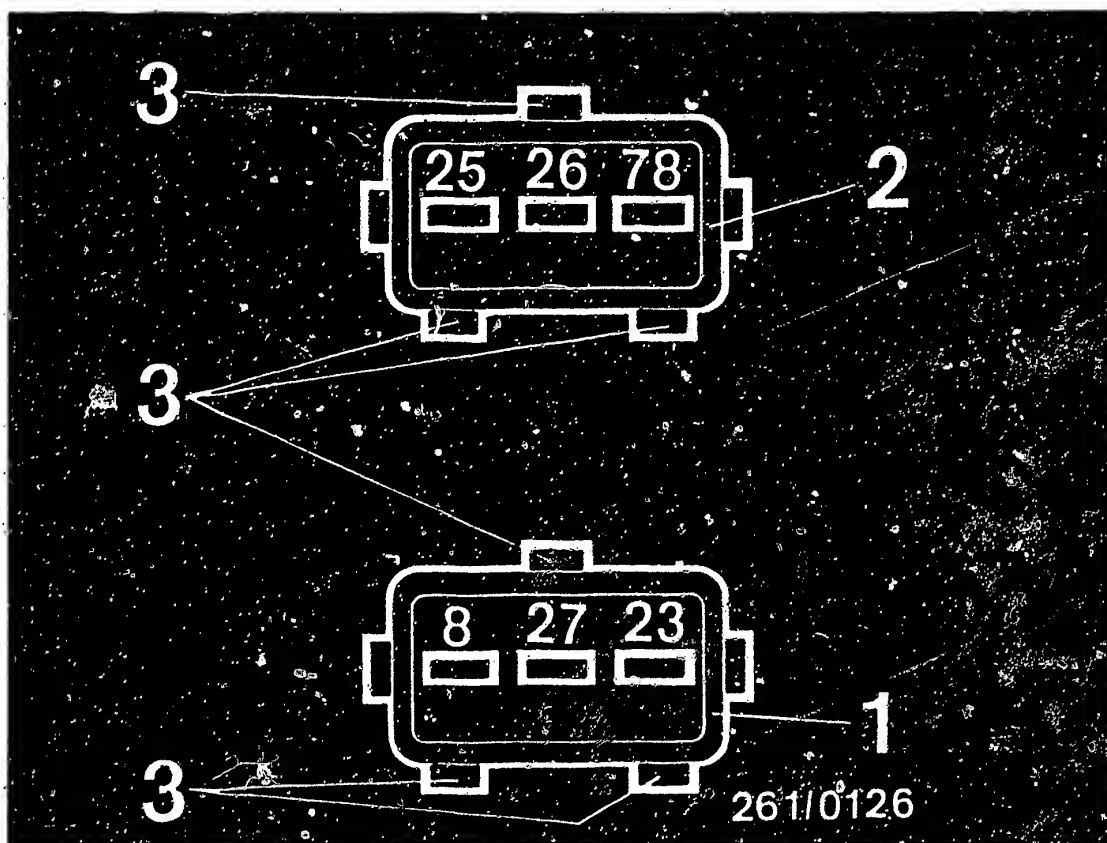
Continued on C1/C2



- 1 = Plug coupling for reference-mark sensor
- 2 = Plug coupling for engine-speed sensor

Top view of 35-pin control unit plug from Motronic wiring harness





Trouble-shooting test step 3 (continued)

View of plug coupling to sensors.

- 1 = Engine-speed sensor coupling (black plug)
- 2 = Reference-mark sensor coupling (gray plug)
- 3 = Lugs to prevent incorrect connection

78, 25, 26, 23, 8, 27 = Terminal numbers

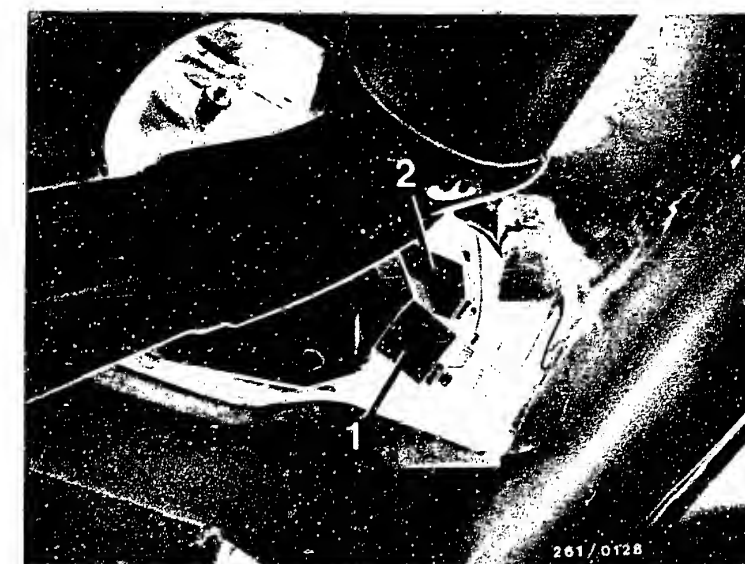


Trouble-shooting - Test step 3 (continued)

Before installing the sensor, make sure that no metallic parts are sticking to the sensor (sensors contain permanent magnets). Grease sensors with Molykote Longterm 2.

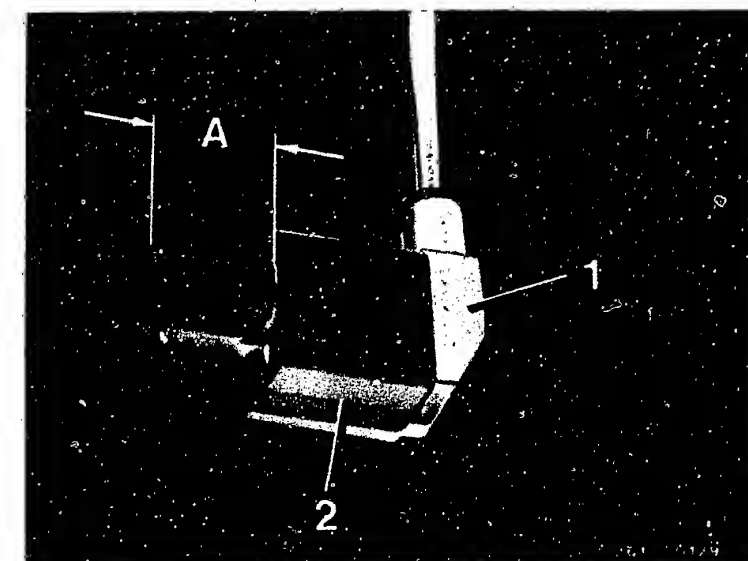
Do not mix up the sensors when installing!

The sensors are plugged into the mounting block and then into the correct bore in the starting-motor ring-gear housing. Do not use force when inserting. Screw down sensor. When mounting, make sure that the connectors are not mixed up. Make sure connector is properly seated and that spring contacts latch into plug. Spring contacts must not allow themselves to be pushed back.



1 = Reference-mark sensor
2 = Engine-speed sensor

1 = Sensor
2 = Mounting block



C1


Testing with universal test adapter
Alfa Romeo Alfa 90



C2

Testing with universal test adapter
Alfa Romeo Alfa 90



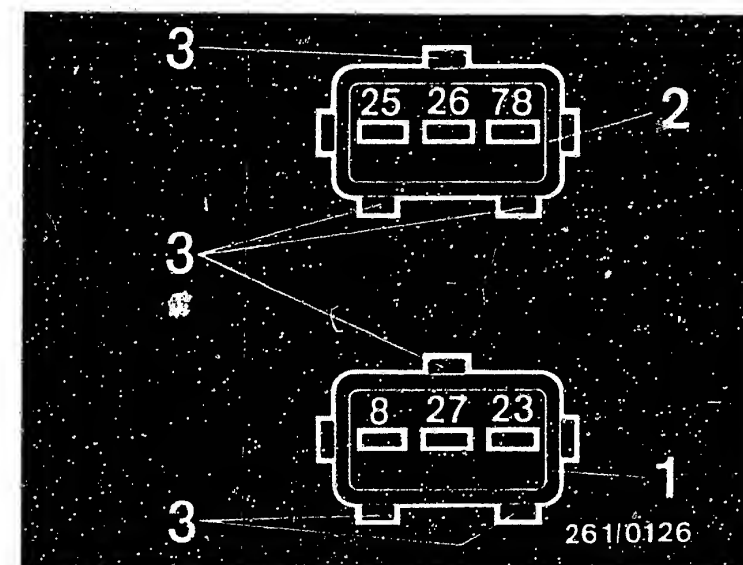
Test step 4			
Operation		Reading	Testing
Program switch "V" at position:		<div></div> Multimeter must indicate: <u>0.6...1.6 kΩ</u>	<u>Component:</u> Reference-mark sensor
Program switch "Ω" at position:			
Measuring equipment: Multimeter (Ω range)			<u>Operation:</u> Winding resistance between Term. 25 and Term. 26
Measuring range: 0 to 10 kΩ			
Connection: Test sockets		If reading OK, continue testing with next test step.	<u>Malfunction:</u> Resistance outside tolerance.
Operation in vehicle: Switch off ignition			

Trouble-shooting:

- Repeat measurement directly at sensor plug.
- Check plug-in connection for corrosion, loose contact (spring contacts must not allow themselves to be pushed back)
- Check leads from reference-mark sensor term. 25 and term. 26 to control unit plug term. 25 and term. 26.
- Replace sensor.

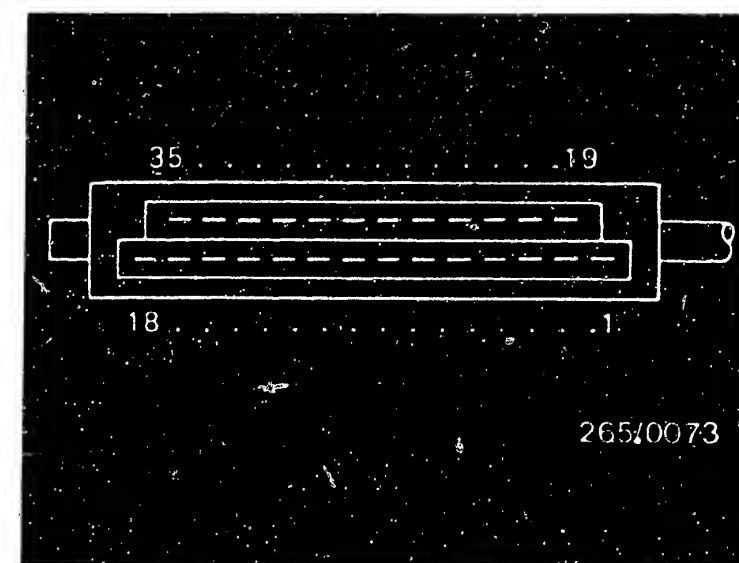
To replace the sensors, undo plug-in connection and unscrew hexagon-socket-head cap screw on sensor. Remove dirt deposits from sensor. If necessary, apply two screwdrivers to the recesses on left and right on the sensor and lift sensor.

Continued on C5/C6



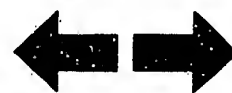
- 1 = Plug coupling for engine-speed sensor
 2 = Plug coupling for reference-mark sensor

Top view of 35-pin control unit plug from Motronic wiring harness



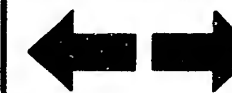
C3

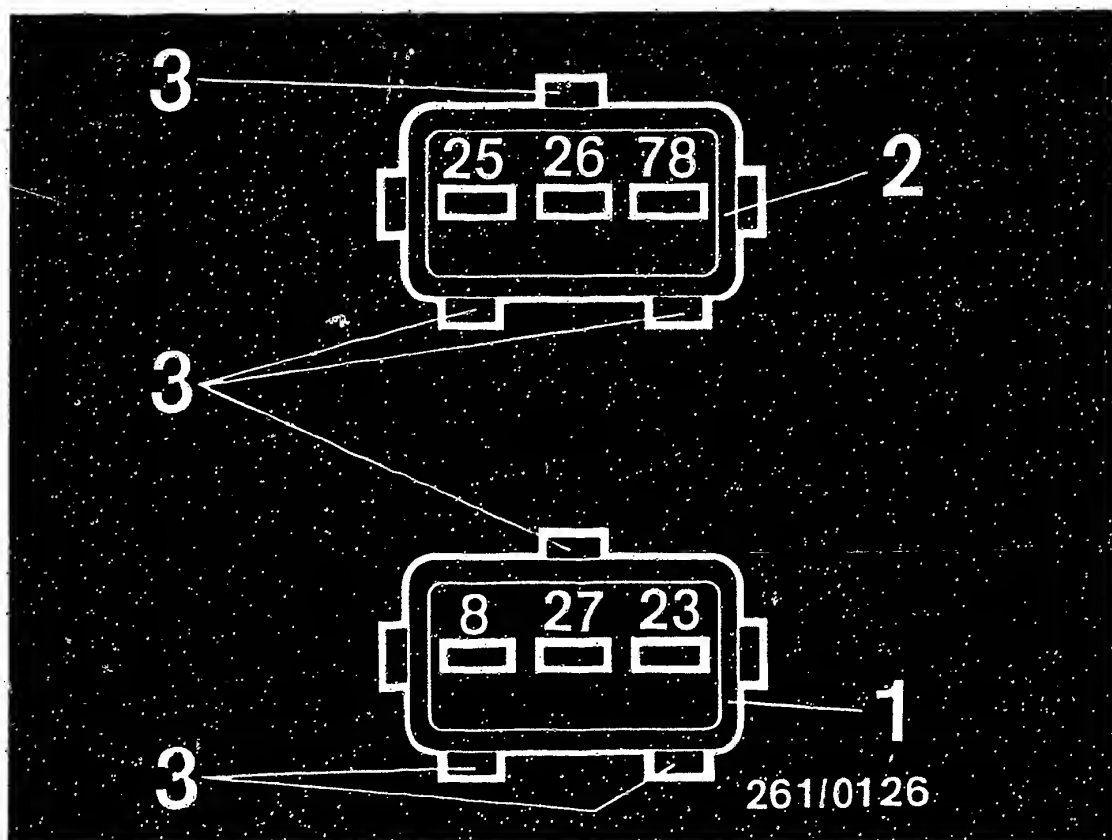
Testing with universal test adapter
 Alfa Romeo Alfa 90



C4

Testing with universal test adapter
 Alfa Romeo Alfa 90





Trouble-shooting test step 4 (continued)

View of plug coupling to sensors.

- 1 = Engine-speed sensor coupling (black plug)
- 2 = Reference-mark sensor coupling (gray plug)
- 3 = Lugs to prevent incorrect connection

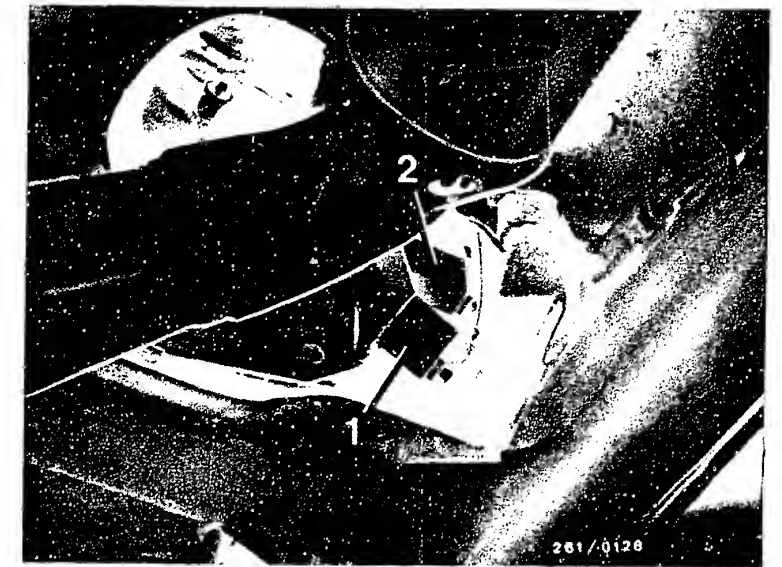
78, 25, 26, 23, 8, 27 = Terminal numbers

Trouble-shooting - Test step 4 (continued)

Before installing the sensor, make sure that no metallic parts are sticking to the sensor (sensors contain permanent magnets). Grease sensors with Molykote Longterm 2.

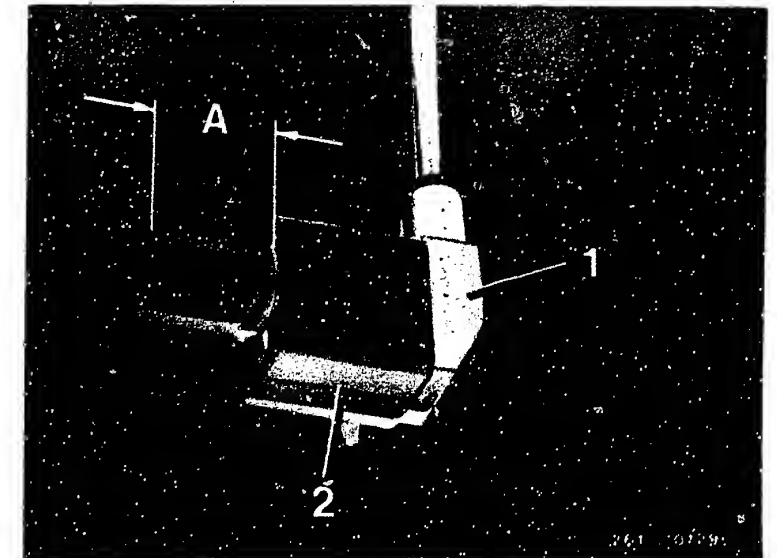
Do not mix up the sensors when installing!

The sensors are plugged into the mounting block and then into the correct bore in the starting-motor ring-gear housing. Do not use force when inserting. Screw down sensor. When mounting, make sure that the connectors are not mixed up. Make sure connector is properly seated and that spring contacts latch into plug. Spring contacts must not allow themselves to be pushed back.



1 = Reference-mark sensor
2 = Engine-speed sensor

1 = Sensor
2 = Mounting block



C6

Testing with universal test adapter
Alfa Romeo Alfa 90



C7

Testing with universal test adapter
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Test step 5		
Operation		Reading
Program switch "V" at position:	↓	Reading is temperature -dependent, i.e. note engine temperature. At ambient temperature (+15°...+30°C): <u>1.45...3.3 kΩ</u> With engine at normal operating temperature (approx. + 80° C): <u>280...360Ω</u> If reading OK, continue testing with next test step.
Program switch "Ω" at position:	5	
Measuring equipment: Multimeter (Ω range)		
Measuring range: 0 to 10 kΩ		
Connection: Test sockets	Ω	Resistance between Term. 13 and ground Resistance outside tolerance. Note temperature.
Operation in vehicle: Switch off ignition		

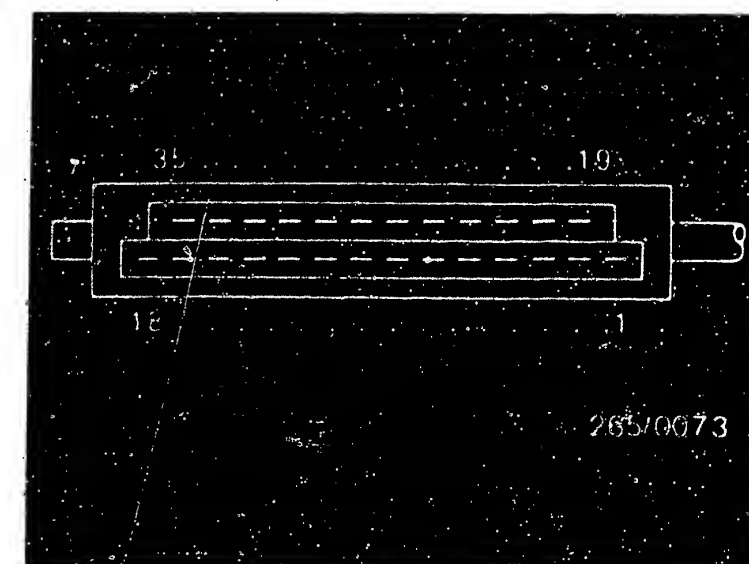
Trouble-shooting:

- Remove plug from temperature sensor and measure resistance directly. If necessary, replace temperature sensor.
- Check leads from temperature sensor to control unit plug term. 13 and to ground terminal.
- Eliminate contact resistances at the plug-in connections. Spring contacts must not allow themselves to be pushed back.



Arrow = Temperature sensor
(NTC II - engine)

Top view of 35-pin control unit plug
from Motronic wiring harness



C8


Testing with universal test adapter
Alfa Romeo Alfa 90

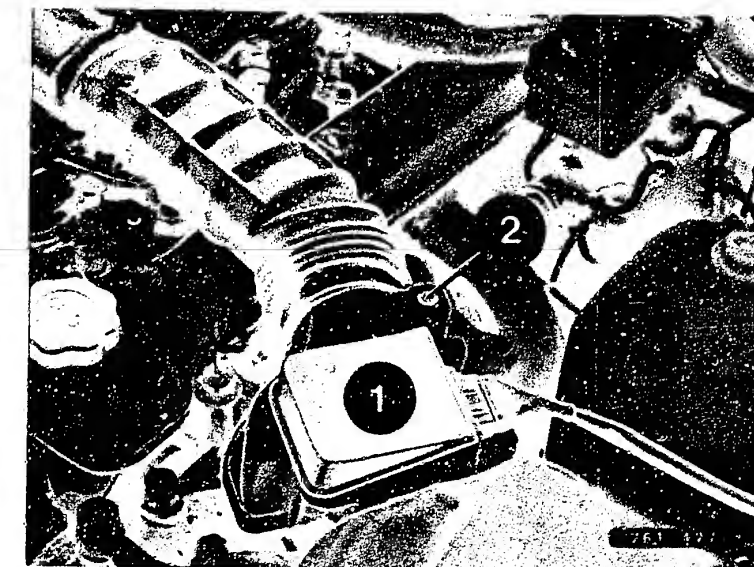


C9

Testing with universal test adapter
Alfa Romeo Alfa 90

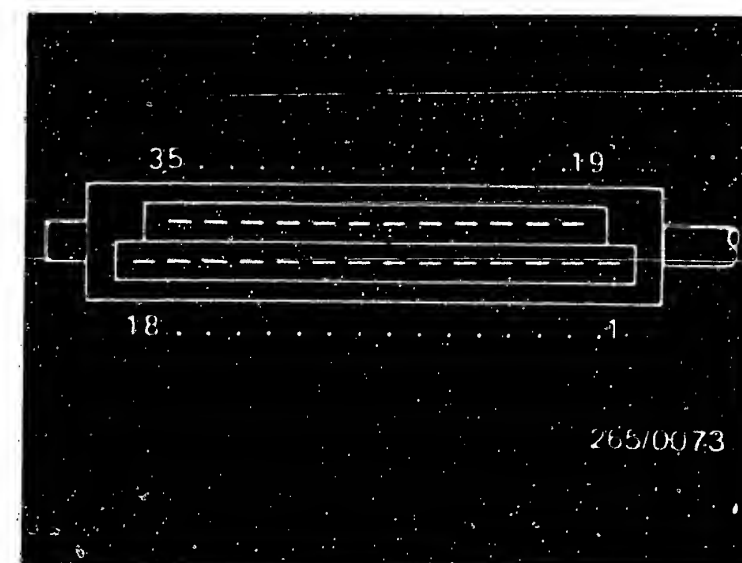


Test step 6			
Operation		Reading	Testing
<u>Program switch "V" at position:</u>		Reading is temperature -dependent, i.e. note engine temperature. At ambient temperature (+15°...+30° C): <u>1,3 ... 3,6 kΩ</u>	<u>Component:</u> Air temperature sensor (NTC I - air)
<u>Program switch "Ω" at position:</u>			
<u>Measuring equipment:</u> Multimeter (Ω range)			<u>Operation:</u> Resistance between Term. 22 and ground
<u>Measuring range:</u> 0 to 10 kΩ			
<u>Connection:</u> Test sockets	Ω	If reading OK, continue testing with next test step.	<u>Malfunction:</u> Resistance outside tolerance. Note temperature.
<u>Operation in vehicle:</u> Switch off ignition			



1 = Air-flow sensor with NTC I
2 = Idle-mixture-adjusting screw

Top view of 35-pin control unit plug from Motronic wiring harness

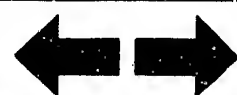


Trouble-shooting:

- Remove plug from air-flow sensor and measure resistance directly at Term. 22 and Term. 6. If reading outside tolerance, replace air-flow sensor.
- Leads from air-flow sensor term. 6 and term. 22 to control unit plug term. 6 and term. 22
- Eliminate contact resistances in the plug-in connections. Spring contacts must not allow themselves to be pushed back.

C10

Testing with universal test adapter
Alfa Romeo Alfa 90

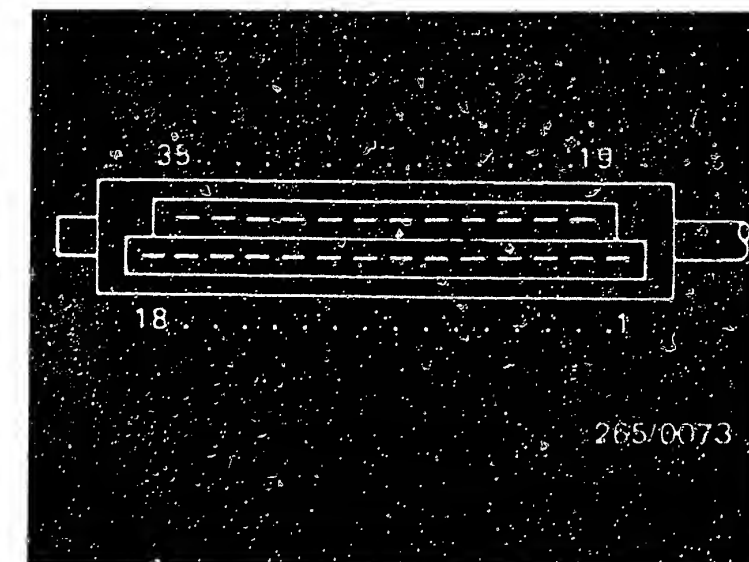


C11

Testing with universal test adapter
Alfa Romeo Alfa 90



Test step 7		
Operation		Reading
Program switch "V" at position:	↓	Multimeter must indicate $\infty \Omega$ On Sweden/Switzerland version: <u>Less than 10 Ω</u> If reading O.K., continue testing with next test step.
Program switch "Ω" at position:	7	
Measuring equipment: Multimeter (Ω range)		
Measuring range: 0 to 10 kΩ		
Connection: Test sockets	Ω	
Operation in vehicle: Switch off ignition		Testing
		Component: Connection from term. 10 to ground.
		Operation: Characteristic-map switchover (spark advance)
		Malfunction: Resistance less than $\infty \Omega$ or greater than 10 Ω



Top view of 35-pin control unit plug from Motronic wiring harness

Trouble-shooting:

- Separate connection from control unit plug term. 10 to ground.

For Sweden/Switzerland version:

- Connect control unit plug term. 10 with ground.

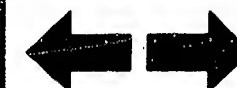
C12

Testing with universal test adapter
Alfa Romeo Alfa 90



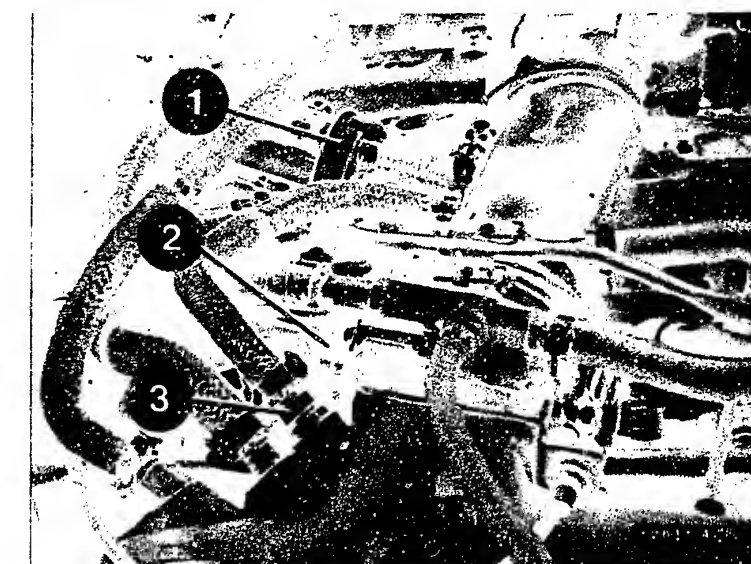
C13

Testing with universal test adapter
Alfa Romeo Alfa 90



Test step 8 deleted

Test step 9		Reading	Testing
Operation			
Program switch "V" at position:	↓	Accelerator in rest position: Less than 10 Ω	Component: Throttle-valve switch
Program switch "Ω" at position:	9	(Measured value is influenced by protective resistor in adapter).	Operation:
Measuring equipment: Multimeter (Ω range)		Accelerator depressed (Part-load range): $\infty \Omega$ 1)	Idle contact between terminal 2 and ground
Measuring range: 0 to 10 kΩ			Malfunction:
Connection: Test sockets	Ω	If reading O.K., continue testing with next test step.	Resistance in rest position greater than 10 Ω.
Operation in vehicle: Switch off ignition			



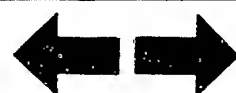
- 1 = Auxiliary-air device
- 2 = Throttle-valve switch
- 3 = Idle-speed adjusting screw

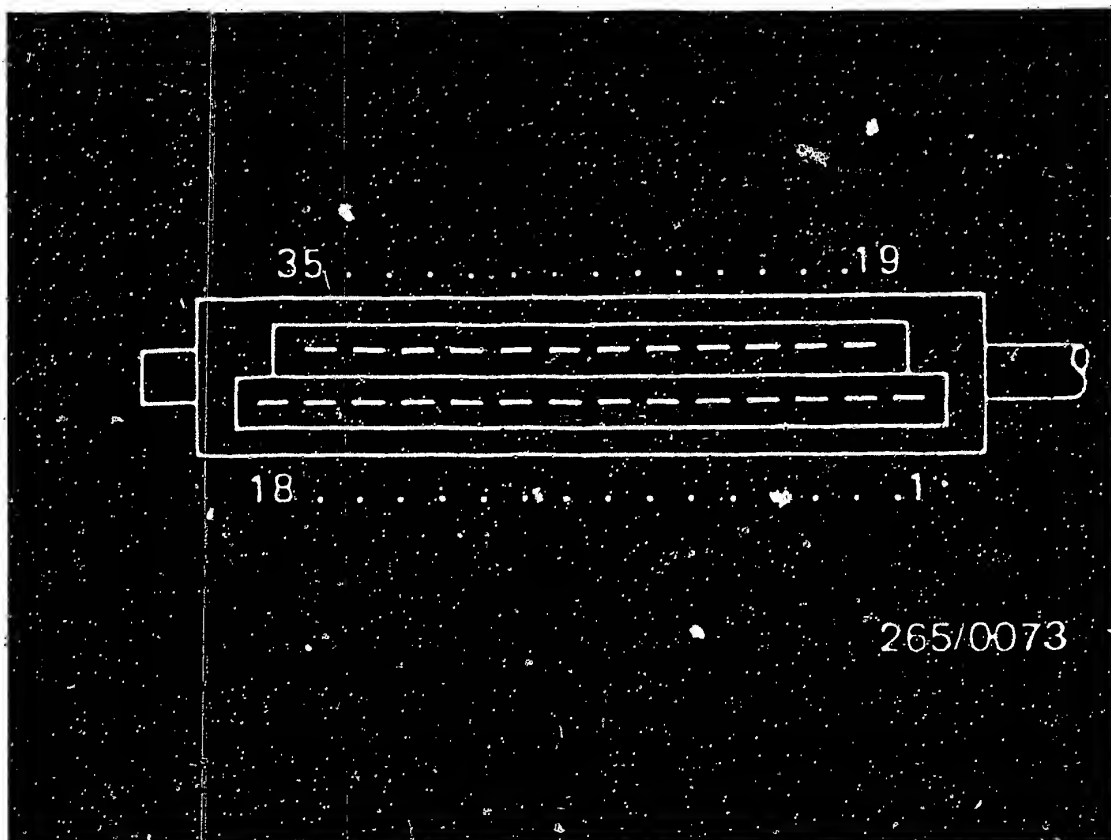
Trouble-shooting:

1) Adjusting the throttle-valve switch:

Loosen the fastening screws. Turn the operating lever to full throttle and slowly return to the idle stop.
Turn the switch in a clockwise direction until the inner stop can be felt. Tighten screws.

Continued on C16





265/0073

Top view of 35-pin control unit plug

Trouble-shooting test step 9 (continued)

Check: slowly depress accelerator pedal towards full load. Reading should change to $\infty \Omega$ after a short actuation travel.

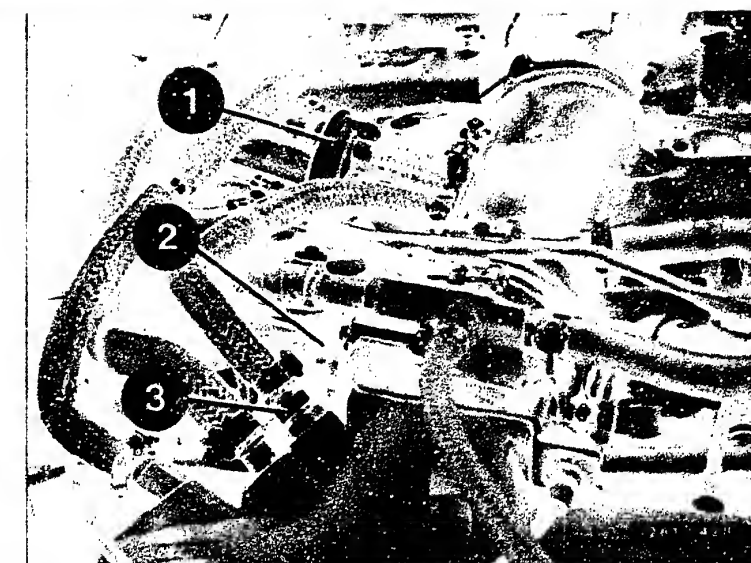
If adjustment is not possible:

Check BOSCH throttle-valve switch as well as lead from throttle-switch term. 2 and term. 43 to control unit plug term. 2 and to ground terminal respectively. Eliminate contact resistances.

Spring contacts must not be able to be pushed back!

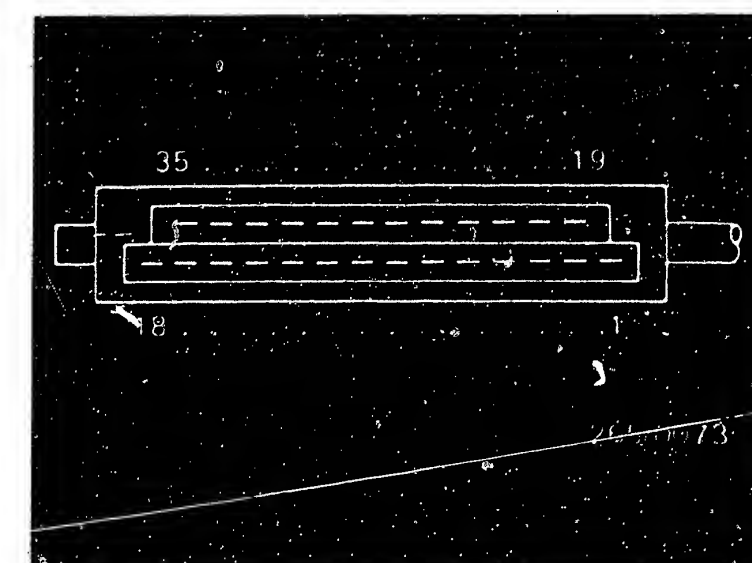


Test step 10		
Operation		Reading
Program switch "V" at position:	↓	Accelerator in part-load position: $\infty \Omega$
Program switch "Ω" at position:	10	Accelerator at full-load stop: Less than 10Ω ¹⁾
Measuring equipment: Multimeter (Ω range)		(Measured value is influenced by protective resistor in adapter)
Measuring range: 0 to 10 kΩ		
Connection: Test sockets	Ω	If reading O.K., continue testing with next test step.
Operation in vehicle: Switch off ignition		
		Testing
		Component: Throttle-valve switch
		Operation: Full-load contact between terminal 3 and ground
		Malfunction: Resistance at full load greater than 10Ω .



- 1 = Auxiliary-air device
2 = Throttle-valve switch
3 = Idle-speed adjusting screw

Top view of 35-pin control unit plug from Motronic wiring harness



Trouble-shooting:

¹⁾ Check: Move the throttle valve in the full-load direction. Reading changes to less than 10Ω (full-load contact closed) shortly before the full-load stop of the operating lever.

Reading greater than 10Ω :

Check whether the throttle valve is opening fully. Check the throttle linkage/Bowden cable from the accelerator to the throttle valve.

Check BOSCH throttle-valve switch as well as lead from throttle-valve switch term. 3 to control unit plug term. 3.

Eliminate contact resistances.

Spring contacts must not allow themselves to be pushed back.

C17

Testing with universal test adapter

Alfa Romeo Alfa 90



C18

Testing with universal test adapter

Alfa Romeo Alfa 90



Test step 11

Operation

Program switch "V"
at position:



Program switch "Ω"
at position:

11

Measuring equipment:

Multimeter (Ω range)

Measuring range:

0 to 10 kΩ

Connection:

Test sockets

Ω

Operation in vehicle:

Switch off ignition

Reading

Multimeter must
indicate
Less than 10 Ω

(Measured value is
influenced by protec-
tive resistor in
adapter)

If reading OK,
continue testing with
next test step.

Testing

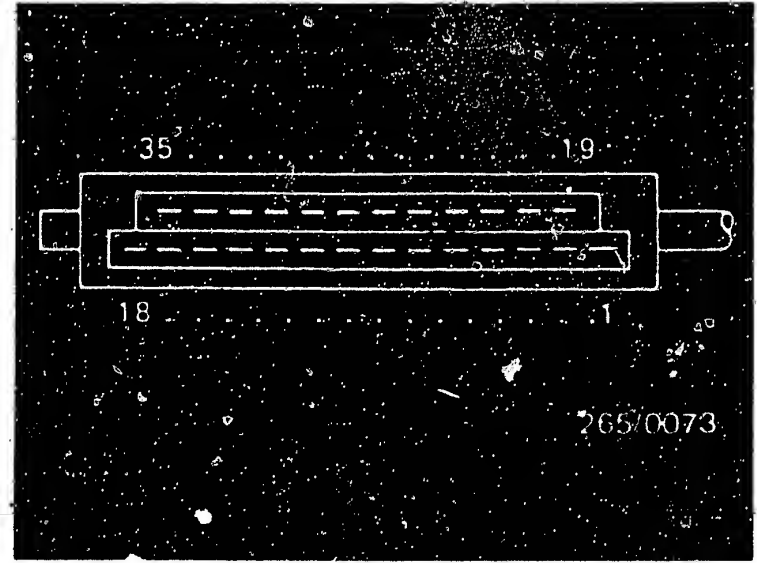
Component:
Ground lead

Operation:

Contact resistance between
Term. 16 and ground

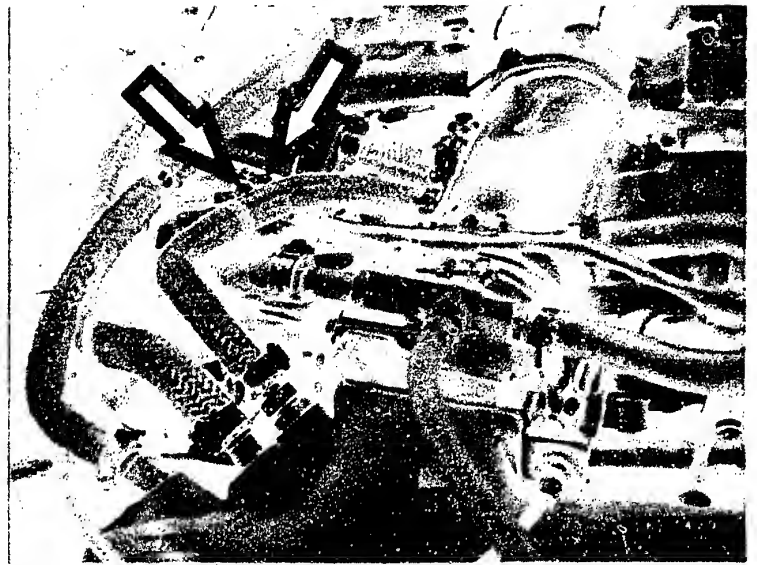
Malfunction:

Resistance greater than 10 Ω



Top view of 35-pin control unit plug
from Motronic wiring harness

Arrows = Ground leads



Trouble-shooting:

For testing, disconnect wiring-harness plug from test adapter and use circuit diagram if necessary.

Test the following lead for continuity with ohmmeter

(Set value approx. 0Ω):

- From multiple plug term. 5 and term. 16 to the ground terminals.

Eliminate contact resistances at the connection points.

Spring contacts must not allow themselves to be pushed back.

C19

Testing with universal test adapter

Alfa Romeo Alfa 90




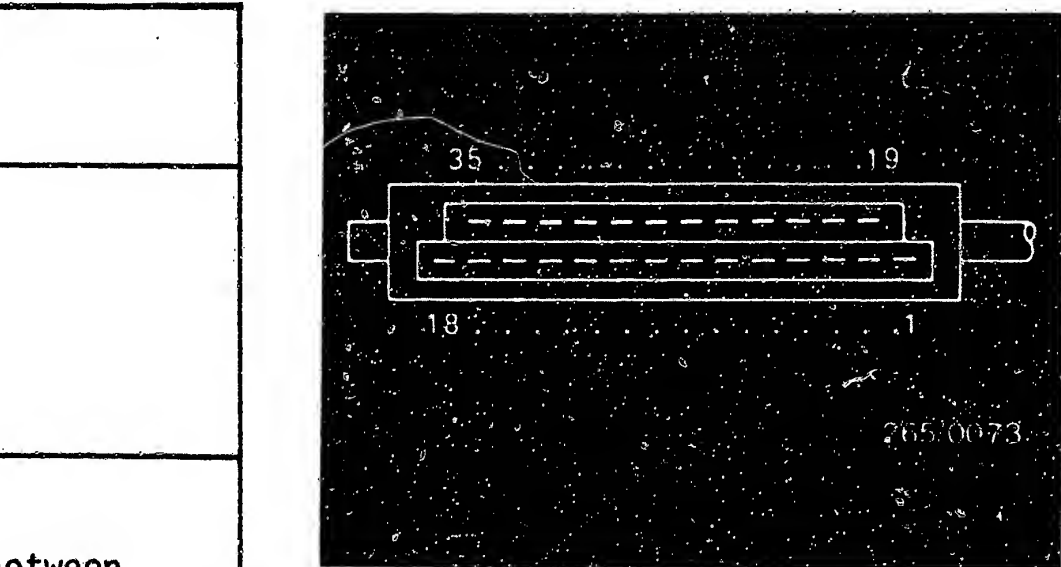
C20

Testing with universal test adapter

Alfa Romeo Alfa 90



Test step 12			
Operation		Reading	Testing
<u>Program switch "V"</u> at position:		 Multimeter must indicate <u>less than 10 Ω</u> (Measured value is influenced by protective resistor in adapter) If reading OK, continue testing with next test step.	<u>Component:</u> Ground lead
<u>Program switch "Ω"</u> at position:			
Measuring equipment:			<u>Operation:</u> Contact resistance between Term. 17 and ground
Multimeter (Ω range)			
Measuring range:			
0 to 10 kΩ			
<u>Connection:</u>		<u>Malfunction:</u> Resistance greater than 10 Ω	
Test sockets			
Ω			
<u>Operation in vehicle:</u>			
Switch off ignition			



Top view of 35-pin control unit plug from Motronic wiring harness

Trouble-shooting:

For testing, remove wiring-harness plug from test adapter and, if necessary, use circuit diagram.

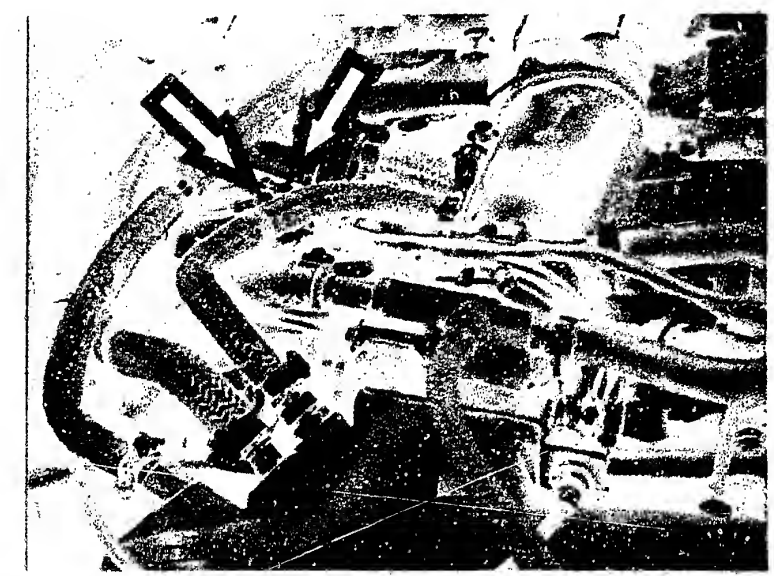
Test the following leads for continuity using ohmmeter (set value approx. 0 Ω):

- From control unit plug term. 17 to the ground terminals.

Eliminate contact resistances at connection points.

Spring contacts must not allow themselves to be pushed back.

Arrows = Ground leads



Test step 13			
Operation		Reading	Testing
Program switch "V" at position:	↓	Multimeter must indicate less than 10 Ω (Measured value is influenced by protective resistor in adapter) If reading OK, continue testing with next test step.	<u>Component:</u> Ground lead
Program switch " Ω " at position:	13		
Measuring equipment:			<u>Operation:</u> Contact resistance between Term. 19 and ground
Multimeter (Ω range)			
Measuring range:			
0 to 10 k Ω			
Connection:			<u>Malfunction:</u> Resistance greater than 10 Ω
Test sockets	Ω		
Operation in vehicle			
Switch off ignition			

Trouble-shooting

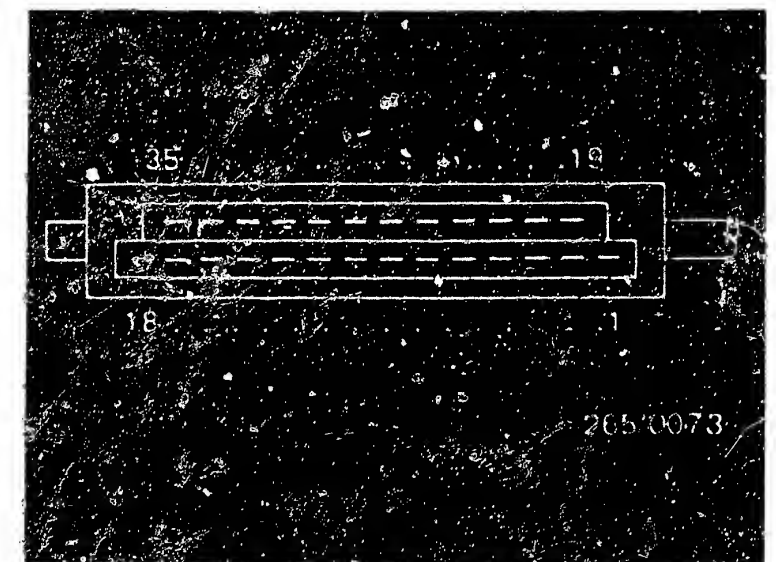
For testing, remove wiring-harness plug from adapter and, if necessary, use circuit diagram.

Test the following leads for continuity using ohmmeter (set value approx. 0 Ω)

- From control unit plug term. 19 to the ground terminals.

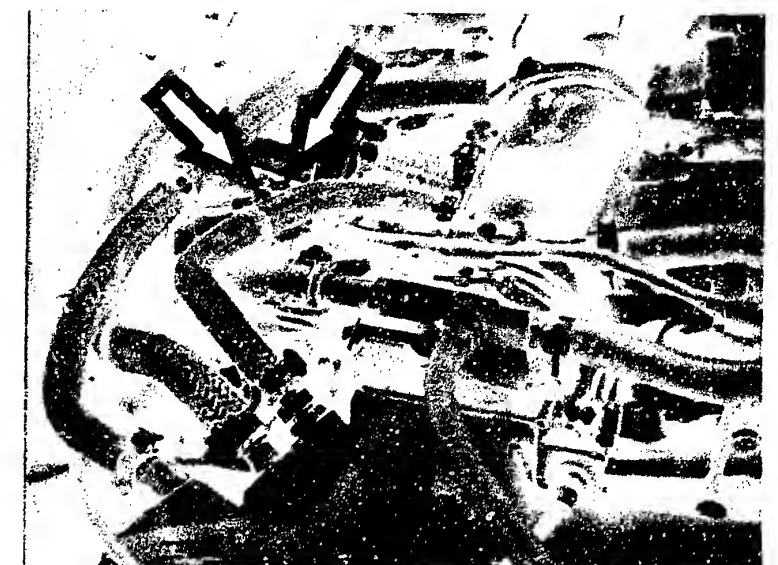
Eliminate contact resistances at connection points.

Spring contacts must not allow themselves to be pushed back.



Top view of 35-pin control unit plug from Motronic wiring harness

Arrows = Ground leads



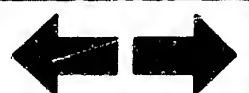
C23

Testing with universal test adapter
Alfa Romeo Alfa 90



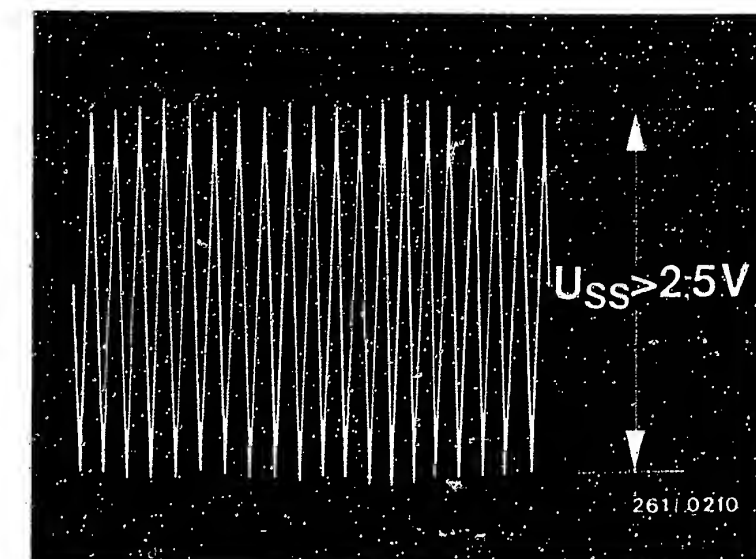
C24

Testing with universal test adapter
Alfa Romeo Alfa 90



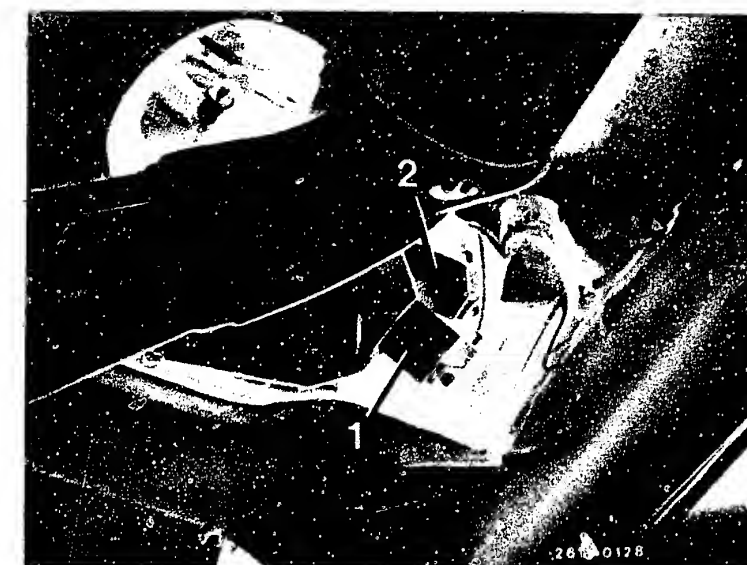
Test step 16 (Test steps 14 and 15 deleted)

Operation		Reading	Testing
Program switch "V" at position:	1	Sensor signal present (upper illustration)	<u>Component:</u> Engine-speed sensor
Program switch "Ω" at position:	15		
<u>Measuring equipment:</u> Motortester, oscilloscope <u>Measuring range:</u> Special input		Lever to left-hand stop (calibrated voltage range) If reading OK, continue testing with next test step.	<u>Operation:</u> Amplitude (signal) at terminals 8 and 27
<u>Connection:</u> Test wells; red clip to red well, black clip to black well <u>Operation in vehicle:</u> Shift gear to neutral and operate starting motor			<u>Malfunction:</u> No signal or signal too small. Incorrect signal



Engine-speed sensor signal

- 1 = Engine-speed sensor
- 2 = Reference-mark sensor



Trouble-shooting:

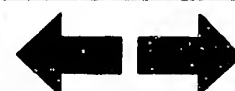
No signal or signal too small:

- Cranking speed below 200 min⁻¹; charge battery.

Continued on D3/D4

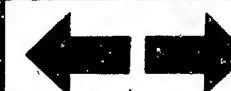
D1

Testing with universal test adapter
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D2

Testing with universal test adapter
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Trouble-shooting for test step 16 (continued)

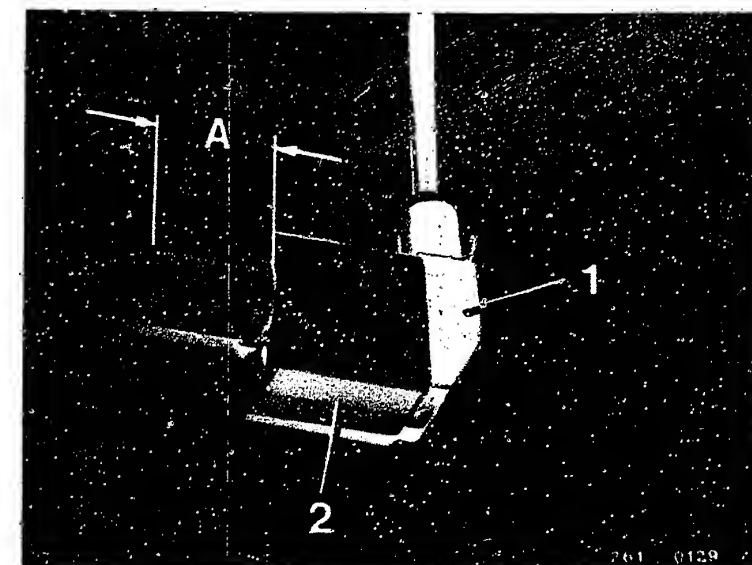
- Test air gap (nominal dimension 0.8 mm) with engine installed as follows:

After removing engine-speed sensor, measure pick-up projection "A" with depth gauge. Make note of measurement. Using depth gauge, measure bore depth as far as head of tooth. Do not measure into tooth gap.

The difference of both dimensions (bore depth minus length of sensor) must be between 0.1 and 0.8 mm.

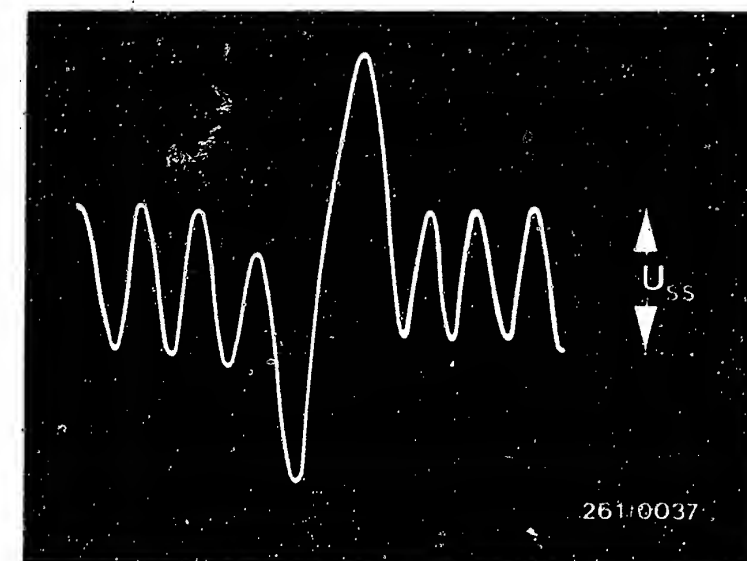
- If signal incorrect (greatly extended in picture):
Heavily damaged tooth on starting-motor ring gear. Replace ring gear.
- Replacing the engine-speed sensor:
To replace the sensors, undo plug-in connection and unscrew hexagon-socket-head cap screw on sensor. Remove dirt deposits on sensor. If necessary, apply two screwdrivers to recesses on left and right on sensor and lift sensor.

Continued on D 5 / D 6



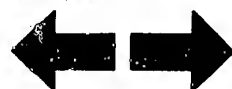
1 = Sensor
2 = Mounting block
A = Pick-up projection

Defective engine-speed sensor signal



D3

Testing with universal test adapter
Alfa Romeo Alfa 90



D4

Testing with universal test adapter
Alfa Romeo Alfa 90



Trouble-shooting for test step 16 (continued)

Before installing the sensors, make sure that there are no metallic parts sticking to the sensor (sensors contain permanent magnets). Grease sensors with "Molykote Longterm 2".

Do not mix up sensors when installing!

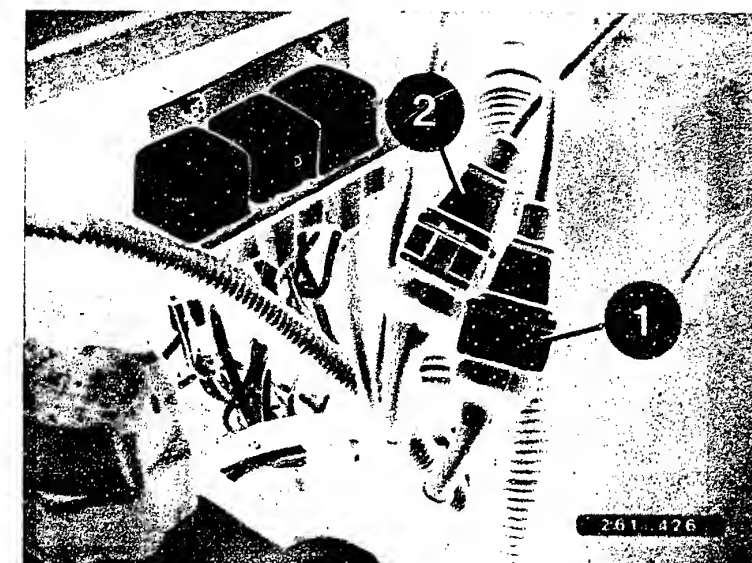
Plug reference-mark sensor onto gray plug.

The sensors are plugged into the mounting block and then into the correct bore in the starting-motor ring gear housing. Do not use force when inserting. Screw down sensors.

When mounting, ensure that the connectors are not mixed up.

Make sure that the connectors are properly seated and that the spring contacts latch into the plug.

Spring contacts must not allow themselves to be pushed back.

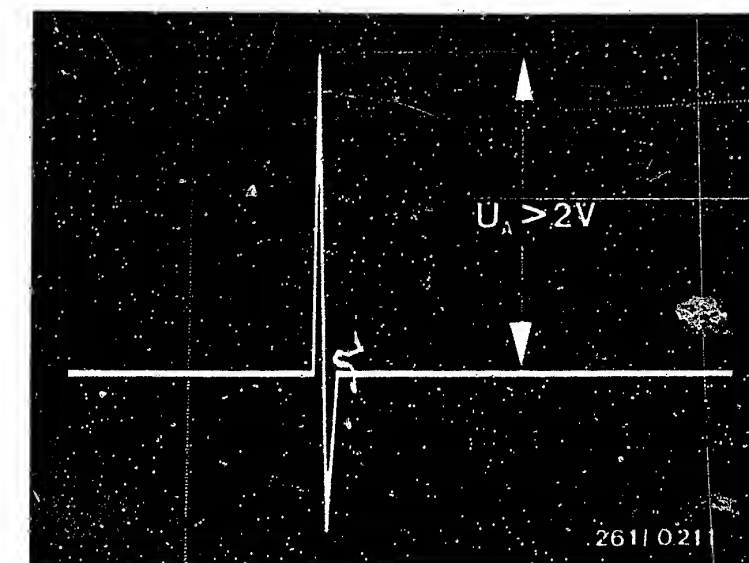


<u>Test step 17</u>			
<u>Operation</u>		<u>Reading</u>	<u>Testing</u>
<u>Program switch "V" at position:</u>	2	Sensor signal present (upper illustration)	<u>Component:</u> Reference-mark sensor
<u>Program switch "Ω" at position:</u>	15		
<u>Measuring equipment:</u> Motortester, oscilloscope		Automatic and manually -shifted transmission Lever to left-hand stop (calibrated voltage range) If reading OK, continue testing with test step 20. (Test steps 18 and 19 deleted).	<u>Operation:</u> Amplitude (signal) at terminals 25 and 26
<u>Measuring range:</u> Special input			
<u>Connection:</u> Test wells; red clip to red well, black clip to black well			
<u>Operation in vehicle:</u> Shift gear to neutral and operate starting motor			
			<u>Malfunction:</u> No signal or signal too small. Incorrect signal.

Trouble-shooting:

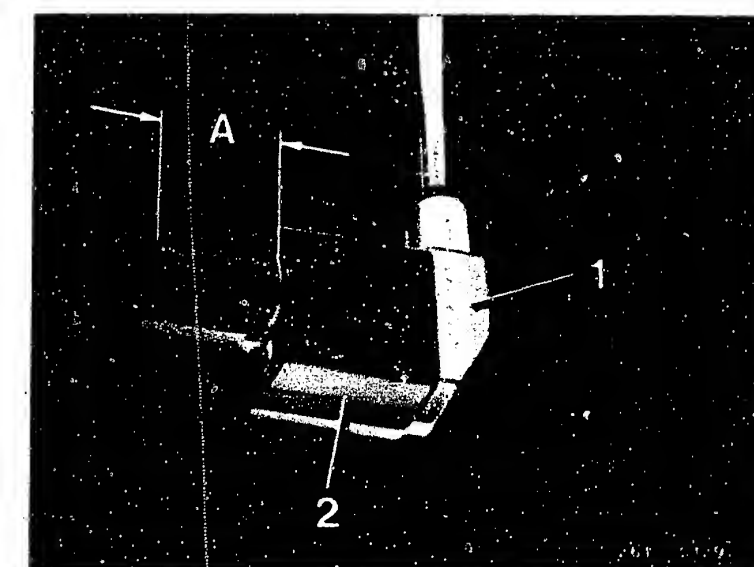
- No signal or signal too small:
Cranking speed less than 200 min⁻¹; battery insufficiently charged.
- Test air gap (nominal dimension 0.8 mm) with engine installed as follows:
Using depth gauge, measure pick-up projection "A" on sensor that has been removed. Make note of dimension.
Bring reference mark toward reference-mark sensor bore by turning the starting-motor ring gear with a screwdriver etc. Using depth gauge, measure bore depth as far as reference mark. The difference of both dimensions (bore depth minus sensor length "A") must be between 0.1 and 0.8 mm.

Continued on D9/D10



Reference-mark sensor signal.
Positive peak must come first.

- 1 = Sensor
- 2 = Mounting block
- A = Pick-up projection



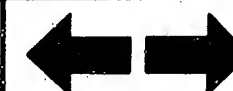
D7

Testing with universal test adapter
Alfa Romeo Alfa 90



D8

Testing with universal test adapter
Alfa Romeo Alfa 90



Trouble-shooting for test step 17 (continued)

● Replacing the reference-mark sensor:

To replace the sensors, undo plug-in connection and unscrew hexagon-socket-head cap screw on sensor. Remove dirt deposits on sensor. If necessary, apply two screwdrivers to the recesses on left and right on the sensor and lift sensor.

Before installing the sensors, make sure that there are no metallic parts sticking to the sensor (sensors contain permanent magnets). Grease sensors with "Molykote Longterm 2".

Do not mix up sensors when installing!

Plug reference-mark sensor onto gray plug.

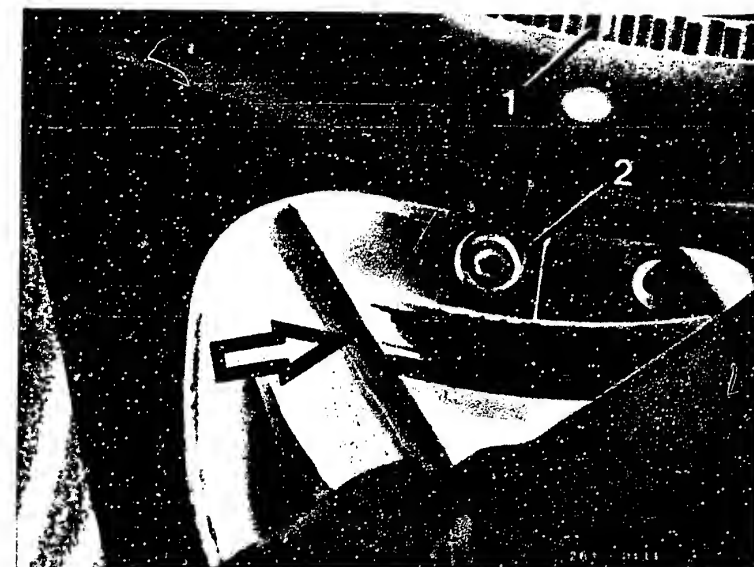
The sensors are plugged into the mounting block and then into the correct bore in the starting-motor ring gear housing. Do not use force when inserting. Screw down sensors.

When mounting, ensure that the connectors are not mixed up.

Make sure that the connectors are properly seated and that the spring contacts latch into the plug.

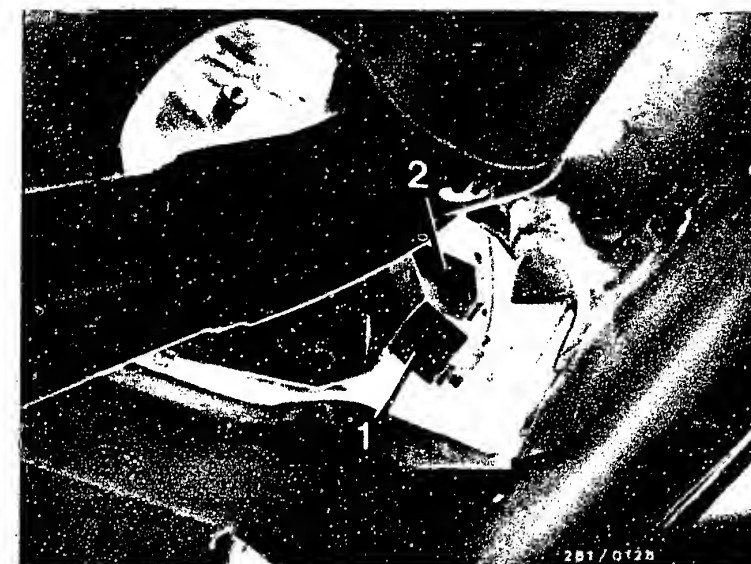
Spring contacts must not allow themselves to be pushed back.

Continued on D 11 / D 12



1 = Ring gear
2 = Reference mark
(viewed with mirror (arrow))

1 = Reference-mark sensor
2 = Engine-speed sensor



D9

Testing with universal test adapter
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D10

Testing with universal test adapter
Alfa Romeo Alfa 90

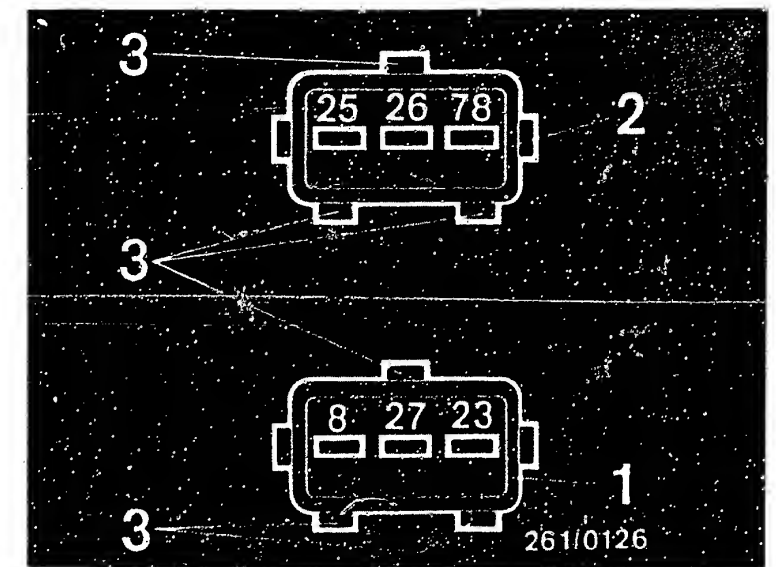


Trouble-shooting - test step 17 (continued)

● Incorrect signal:

Signal incorrect if negative peak comes first.

Check assignment of leads according to circuit diagram and illustration opposite.



Top view of sensor connectors

1 = Connector of engine-speed sensor

2 = Connector of reference-mark sensor with marking

3 = Locating lugs

78, 25, 26, 23, 8, 27 =
Terminal numbers

D11

Testing with universal test adapter

Alfa Romeo Alfa 90



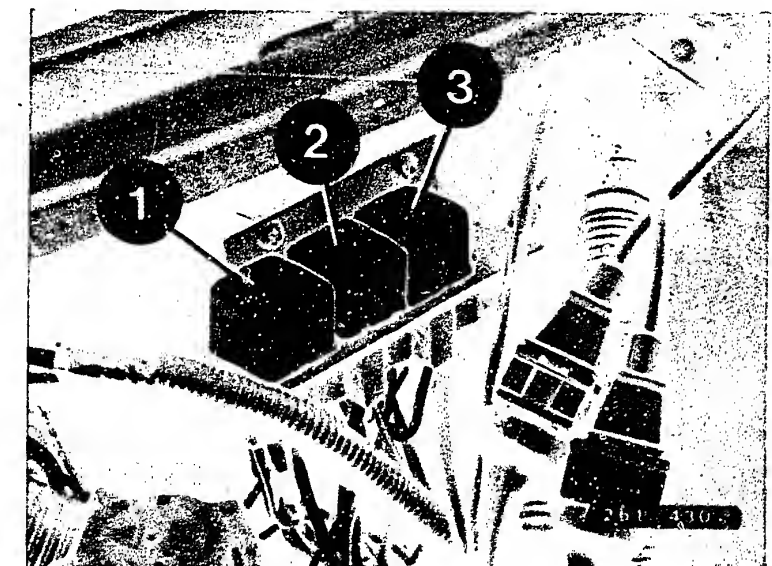
D12

Testing with universal test adapter

Alfa Romeo Alfa 90

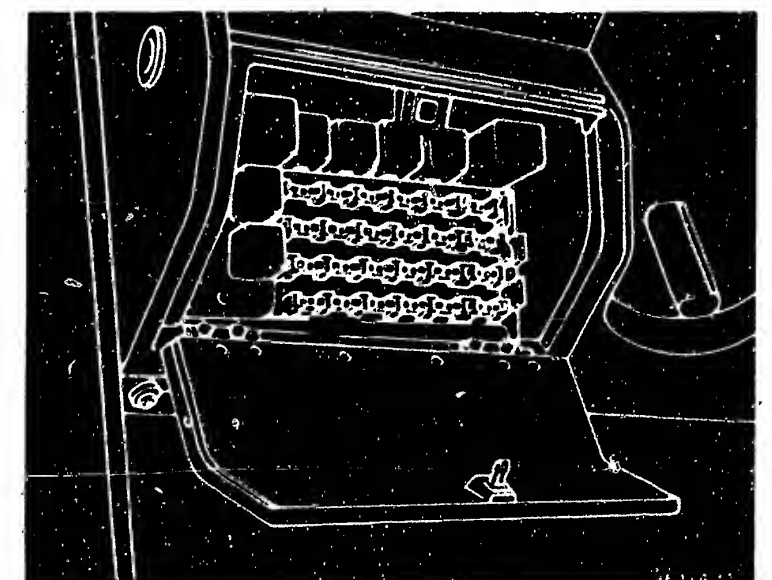


Test step 20		(Test steps 18 and 19 deleted)	
Operation		Reading	Testing
<u>Program switch "V" at position:</u>	6	Multimeter must indicate: <u>10 ... 15 V</u>	<u>Components:</u> Relay 2 (main relay)
<u>Program switch "Ω" at position:</u>	15		
<u>Measuring equipment:</u> Multimeter (V range)			If reading OK, continue testing with <u>next test step</u>
<u>Measuring range:</u> 15 V			
<u>Connection: Test sockets,</u> (red = +, black = ground)	V	<u>Malfunction:</u> Voltage less than 10 V	
<u>Operation in vehicle:</u> Switch on ignition			



- 1 = Relay 1 (relay)
 2 = Relay 2 (main relay)
 3 = Relay 3 (camshaft energization)

Fuse no. 22 for Motronic



Trouble-shooting:

1. Voltage less than 10 V: Battery insufficiently charged or high voltage drops at terminals.

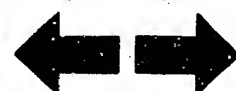
2. No voltage reading: Check fuse No. 22 and relay 2.
 Perform the following voltage measurements at the relay with the ignition on:

- Measure battery voltage at Term. 87 (2x), Term. 86 and Term. 30.
 Measure ground connection Term. 85 to B+ (test adapter connected).
- Check lead from relay 2 term. 87 to control unit plug term. 35.
- Check Motronic ground terminal (no. 5), also lead 5.

Note: If replacing relay 2, make sure that only relay with blocking diode is installed. Note symbol on relay housing.

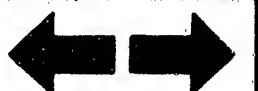
D13

Testing with universal test adapter
 Alfa Romeo Alfa 90



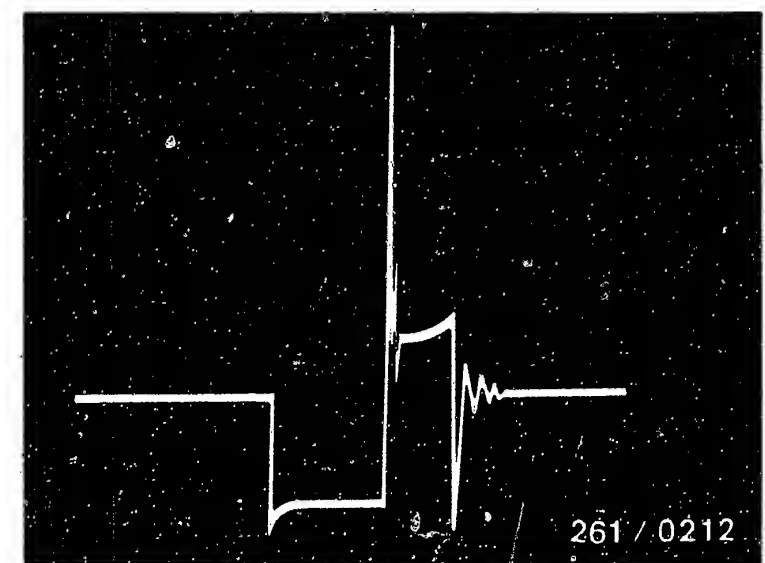
D14

Testing with universal test adapter
 Alfa Romeo Alfa 90



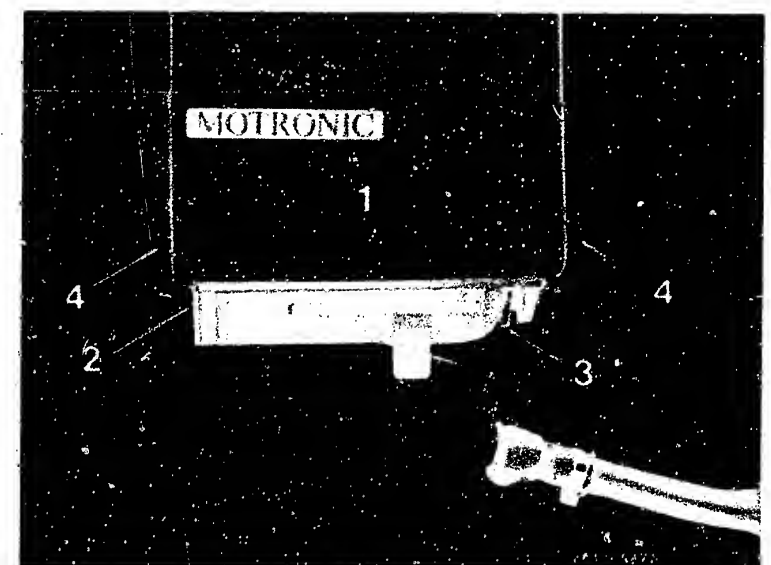
Test step 22 Ignition off. Connect control unit. (Test step 21 not applicable)

Operation		Reading	Testing
Program switch "V" at position:	5	Primary signal present (upper illustration)	Component: Ignition coil, H.T. ignition cables, control unit
Program switch "Ω" at position:	15		Operation: Primary signal from ignition coil terminal 1 to ground
Measuring equipment: Motortester, oscilloscope			Malfunction: No signal or incorrect signal.
Measuring range: Special input		If reading OK, continue testing with next test step	
Connection: Test wells; red clip to red well, black clip to black well, triggering on cylinder 1			
Operation in vehicle: Shift gear to neutral and operate starting motor			



Primary signal

- 1 = Control unit
- 2 = Locating lug
- 3 = Detent
- 4 = Mounting hole



Trouble-shooting:

- Test Motronic ground terminals:
Terminals must be bare and screws must be tight.
- Test ignition coil including cables and high-voltage lines.
Spring contact on control unit plug term. 1 must not be able to be pushed back.
- Check lead from ignition coil term. 15 to ignition lock term. 15.
- Replace control unit.

Note:

To rule out confusion of control units between the various systems, a mechanical locking system has been introduced. The "lug" (pivot point when opening and connecting the control unit) and the corresponding mount of the control unit have matching recesses/pins.

D 15

Testing with universal test adapter

Alfa Romeo Alfa 90



D 16

Testing with universal test adapter

Alfa Romeo Alfa 90



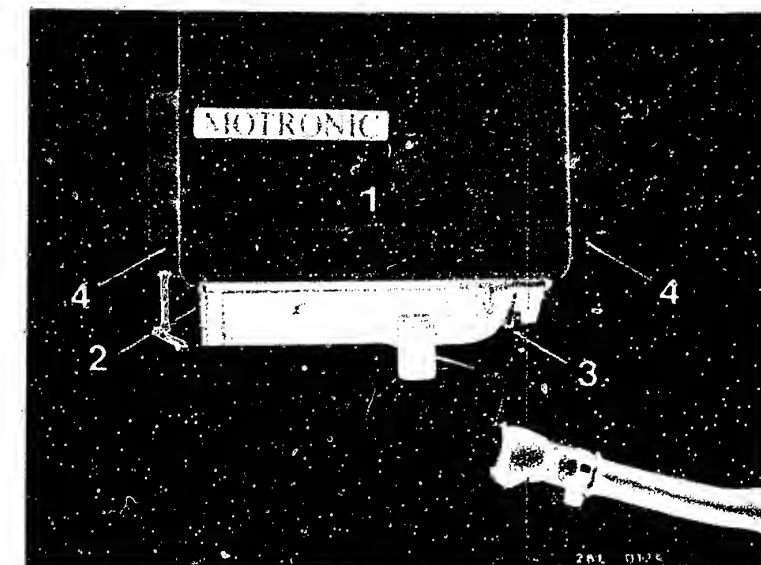
Test step 23			
Operation		Reading	Testing
<u>Program switch "V"</u> at position:	8	Multimeter must indicate <u>4,5 ... 5,5 V</u>	<u>Component:</u> Control unit
<u>Program switch "Ω"</u> at position:	15		
<u>Measuring equipment:</u> Multimeter (V range)			<u>Operation:</u> Supply voltage for air-flow sensor at terminal 9 and ground
<u>Measuring range:</u> 15 V			
<u>Connection:</u> Test sockets, (red = +, black = Ground)	V	<u>If reading OK,</u> continue testing with <u>next test steps.</u>	<u>Malfunction:</u> Voltage outside tolerance
<u>Operation in vehicle:</u> Switch on ignition			

Trouble-shooting:

- Replace control unit

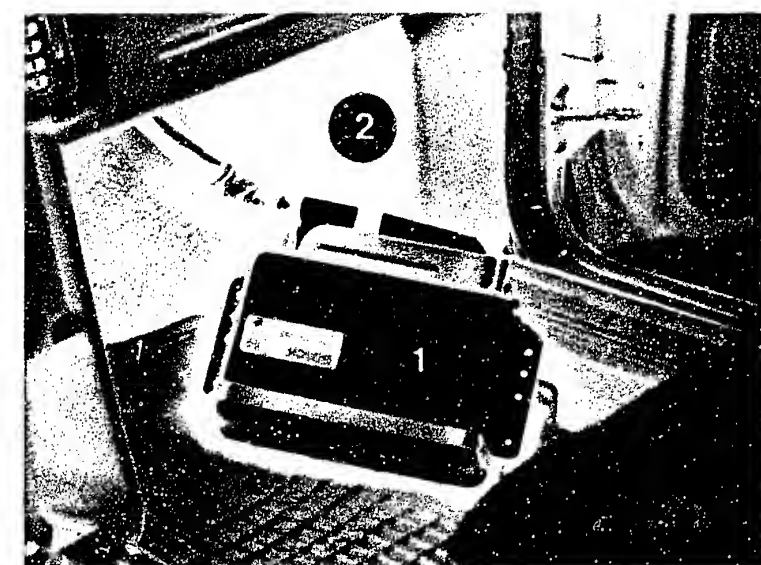
Note

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.



- 1 = Control unit
- 2 = Locating lug
- 3 = Detent
- 4 = Mounting holes

- 1 = Control unit
- 2 = Plastic cover



D17

Testing with universal test adapter
Alfa Romeo Alfa 90

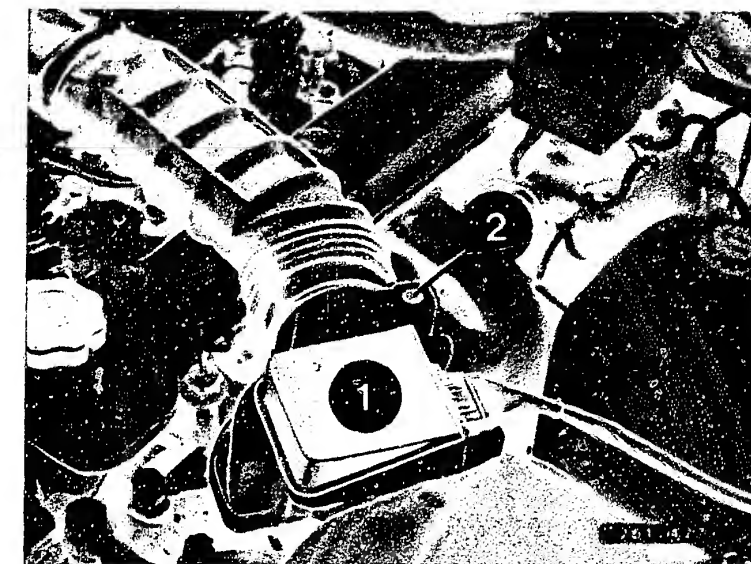


D18

Testing with universal test adapter
Alfa Romeo Alfa 90

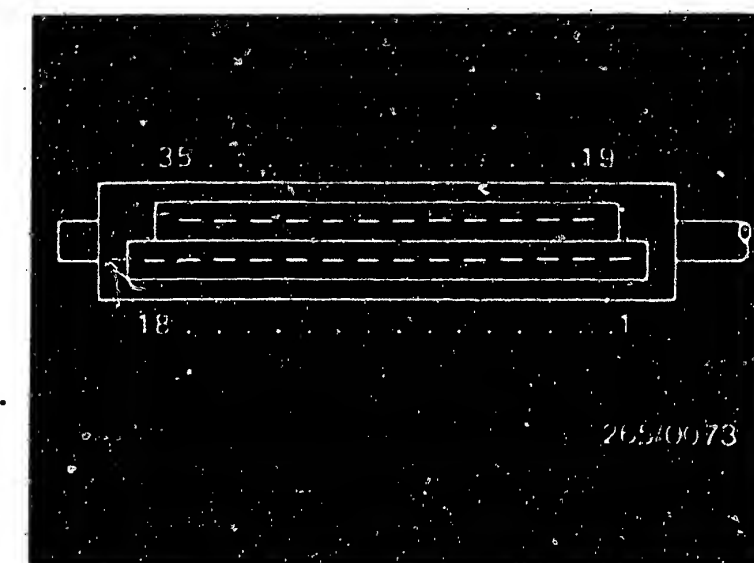


Test step 24			
Operation		Reading	Testing
<u>Program switch "V"</u> <u>at position:</u>	9	Multimeter must indicate <u>200 ... 300 mV</u>	<u>Component:</u> Air-flow sensor
<u>Program switch "Ω"</u> <u>at position:</u>	15	With air-flow sensor flap closed. Loosen hose from air-flow sensor and open sensor flap by hand. Sensor flap must not catch and must return automatically to rest position when released. With sensor flap fully open the reading rises to <u>above 4,2V</u> (change over measuring range).	
<u>Measuring equipment:</u> Multimeter (V range)			<u>Operation:</u> Divider voltage at terminal 7 and ground
<u>Measuring range</u> 1.5 V			
<u>Connection:</u> Test sockets (red = +, black = ground) V		If reading OK, continue testing with test step 27. Test steps 25 and 26 deleted.	<u>Malfunction:</u> No voltage or voltage too low
<u>Operation in vehicle:</u> Switch on ignition			



1 = Air-flow sensor with NTC I
2 = Idle-mixture-adjusting screw

Top view of 35-pin control unit plug from Motronic wiring harness



Trouble-shooting:

No reading:

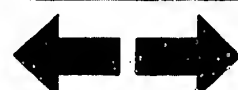
- Check leads from air-flow sensor terms. 6,7, and 9 to control unit plug terms. 6,7, and 9.
- Spring contacts must not allow themselves to be pushed back.

If reading outside tolerance:

- Check whether air-flow sensor flap is closing fully.
- Replace air-flow sensor.

D19

Testing with universal test adapter
Alfa Romeo Alfa 90



D20

Testing with universal test adapter
Alfa Romeo Alfa 90

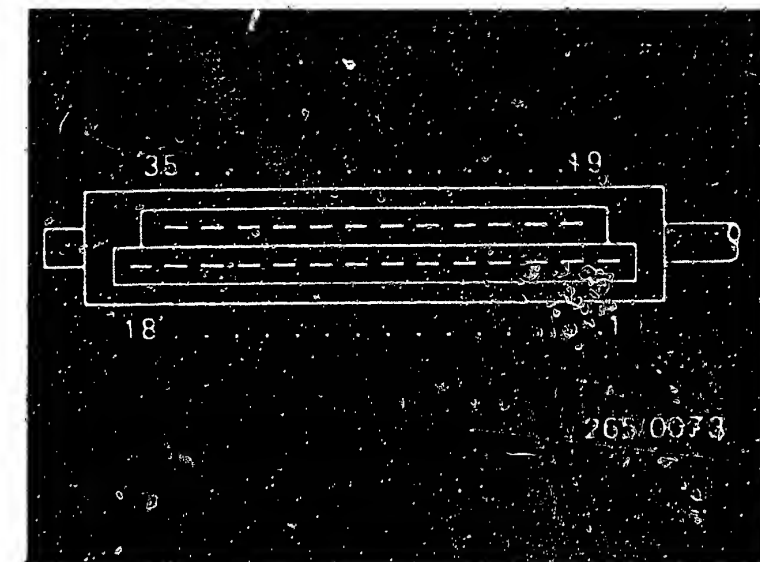


Test step 27

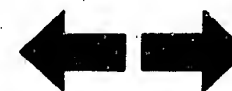
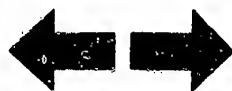
<u>Operation</u>		<u>Reading</u>	<u>Testing</u>
<u>Program switch "V"</u> <u>at position:</u>	12	Multimeter must indicate <u>8...15 V</u> during cranking.	<u>Component:</u> Lead 4 from starting motor term. 50 to control unit plug term. 4
<u>Program switch "Ω"</u> <u>at position:</u>	15		
<u>Measuring equipment:</u> Multimeter (V range)			
<u>Measuring range:</u> 15 V			
<u>Connection:</u> Test sockets (red = +, black = ground)	V	If reading OK, continue testing with <u>next test step.</u>	<u>Operation:</u> Voltage test at terminal 4
<u>Operation in vehicle:</u> Shift gear to neutral and operate starting motor.			
			<u>Malfunction:</u> Voltage less than 8 V

Trouble-shooting:1. Voltage less than 8 V:

- Test voltage drop at starting motor terminal 50.
- Check lead from control unit plug terminal 4 to starting motor terminal 50.



Top view of 35-pin control unit plug from Motronic wiring harness



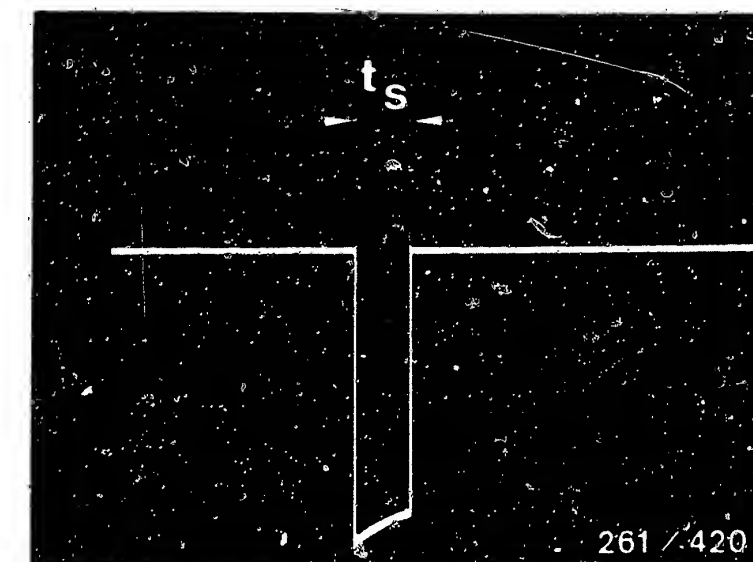
Test step 28			
Operation		Reading	Testing
Program switch "V" at position:	13	Dwell-period signal present (upper illustration)	Component: Control unit
Program switch "Q" at position:	15		
Measuring equipment: Motortester, oscilloscope			Operation: Dwell-period signal at terminal 21 and ground
Measuring range: Special input			
Connection: Test wells; red clip to red well, black clip to black well			Malfunction: No signal
Operation in vehicle: Shift gear to neutral and operate starting motor		If reading OK, continue testing with next test step.	

Trouble-shooting:

- Replace control unit

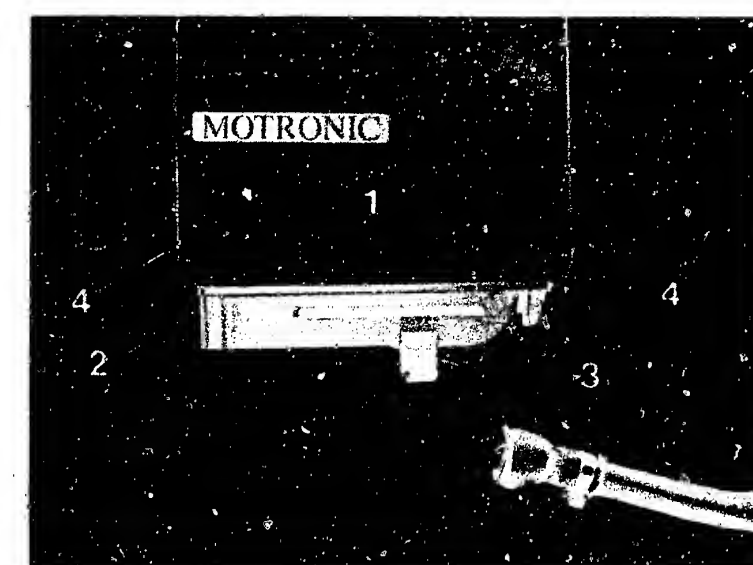
Note:

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins



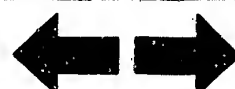
Dwell-period signal
 t_s = Dwell period

- 1 = Control unit
- 2 = Locating lug
- 3 = Detent
- 4 = Mounting holes



D23

Testing with universal test adapter
Alfa Romeo Alfa 90



D24

Testing with universal test adapter
Alfa Romeo Alfa 90



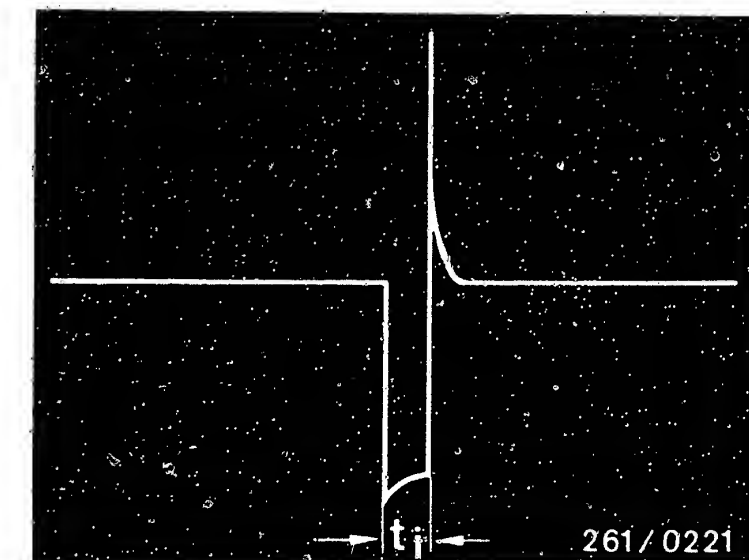
Test step 29			
Operation		Reading	Testing
Program switch "V" at position:	14	Injection signal present (upper illustration).	<u>Component:</u> Power supply for solenoid-operated injection valves, control unit
Program switch "Ω" at position:	15		
<u>Measuring equipment:</u> Motortester, oscilloscope			
<u>Measuring range:</u> Special input			
<u>Connection:</u> Test wells; red clip to red well, black clip to black well			<u>Operation:</u> Injection output stage at terminal 14 and ground
<u>Operation in vehicle:</u> Shift gear to neutral and operate starting motor		If reading OK, continue testing with <u>next test step.</u>	<u>Malfunction:</u> No signal

Trouble-shooting:

- Check power supply to injection valves:
Remove connector from all solenoid-operated injection valves and measure voltage to ground at both terminals. Battery voltage must be measured at each solenoid-operated injection valve connector. If no voltage, test leads from injection-valve connectors to main relay term. 87.
- Check lead from control unit plug term. 14 to solenoid-operated injection valves for cylinders 3 and 4.
- Replace control unit.

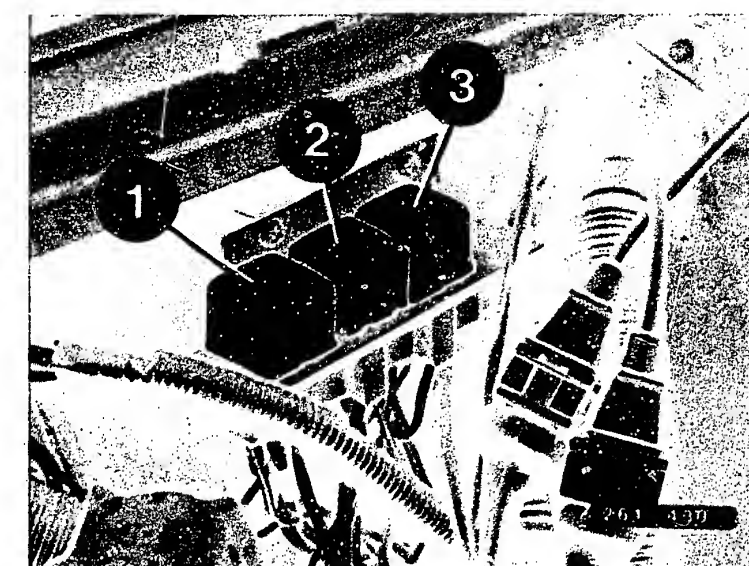
Note:

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.



Injection signal
 t_i = Duration of injection

- 1 = Relay 1 (pump relay)
- 2 = Relay 2 (main relay)
- 3 = Relay 3 (camshaft energization)



E1

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 Alfa Romeo Alfa 90



E2

Testing with universal test adapter
 Alfa Romeo Alfa 90



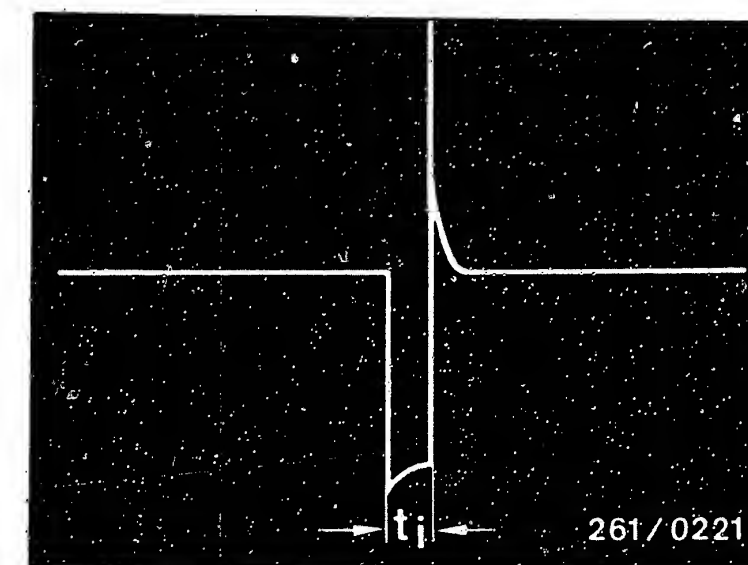
Test step 30			
Operation		Reading	Testing
<u>Program switch "V" at position:</u>	14	Duration of injection t_i becomes slightly longer after pressing button T1 (NTC II, cold). <u>Only press T1 briefly; otherwise mixture will be too rich for engine.</u>	<u>Component:</u> Control unit
<u>Program switch "Ω" at position:</u>	15		
<u>Measuring equipment:</u> Motortester, oscilloscope			
<u>Measuring range:</u> Special input			<u>Operation:</u> Influence of temperature
<u>Connection:</u> Test wells; red clip to red well, black clip to black well			
<u>Operation in vehicle:</u> Shift gear to neutral and operate starting motor			<u>Malfunction:</u> Signal does not become wider after pressing button T1
<u>Button:</u> Press T1			

Trouble-shooting:

Replace control unit

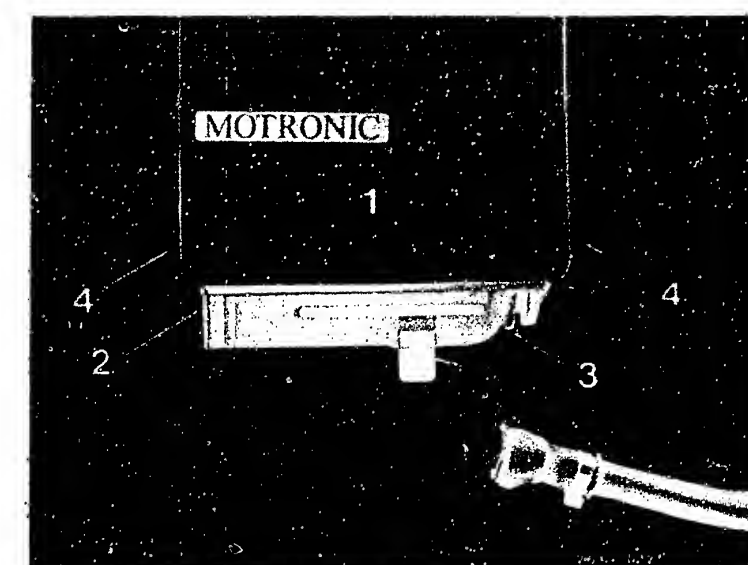
Note:

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.



Injection signal
 t_i = Duration of injection

- 1 = Control unit
- 2 = Locating lug
- 3 = Detent
- 4 = Mounting holes



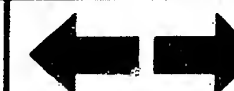
E3

Testing with universal test adapter
 Alfa Romeo Alfa 90



E4

Testing with universal test adapter
 Alfa Romeo Alfa 90



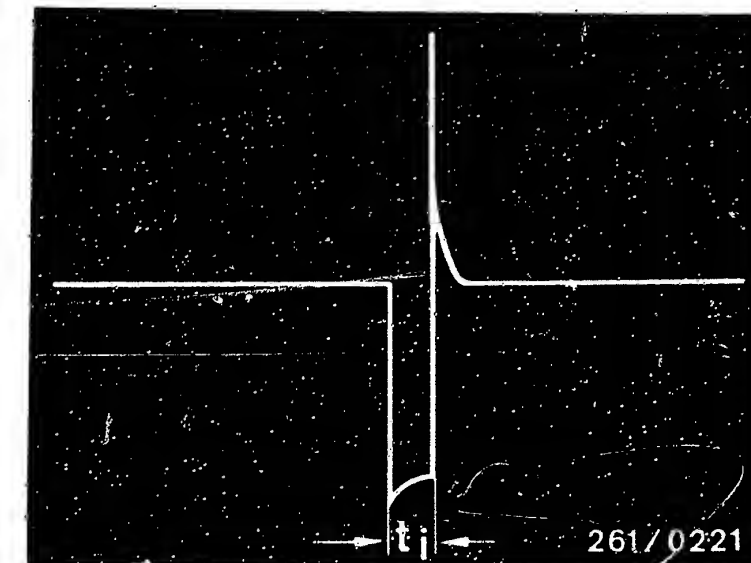
<u>Test step 31</u>		<u>Reading</u>	<u>Testing</u>
<u>Operation</u>			
<u>Program switch "V" at position:</u>	15	Injection signal present (upper illustration)	<u>Component:</u> Control unit
<u>Program switch "Ω" at position:</u>	15		
<u>Measuring equipment:</u> Motortester, oscilloscope			<u>Operation:</u> Injection output stage at terminal 15 and ground
<u>Measuring range:</u> Special input			
<u>Connection:</u> Test wells; red clip to red well, black clip to black well		If reading OK, continue testing with next test step.	<u>Malfunction:</u> No signal
<u>Operation in vehicle:</u> Shift gear to neutral and operate starting motor			

Trouble-shooting:

- Check power supply to injection valves:
Remove connector from all solenoid-operated injection valves and measure voltage to ground at both terminals. Battery voltage must be measured at each solenoid-operated injection valve connector. If no voltage, test leads from injection-valve connectors to main relay term. 87.
- Check lead from control unit plug term. 15 to solenoid-operated injection valves for cylinders 1 and 2.
- Replace control unit.

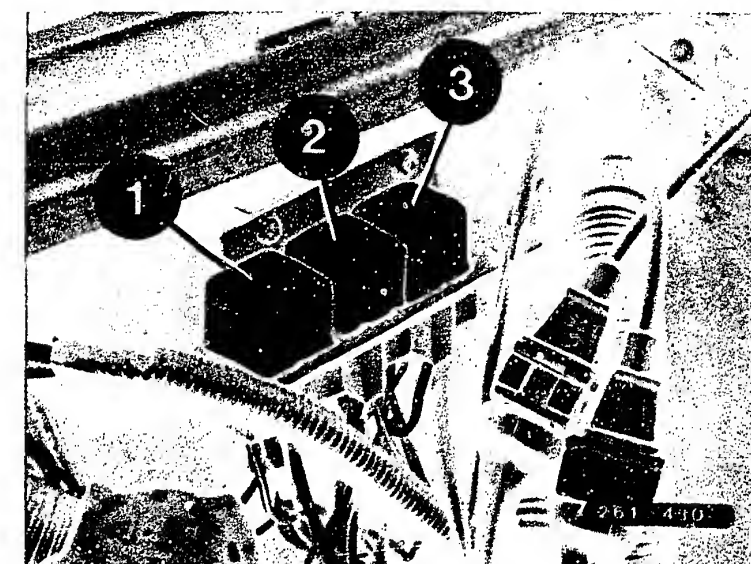
Note:

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.



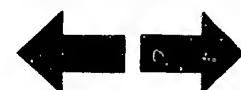
Injection signal
 t_i = Duration of injection

- 1 = Relay 1 (pump relay)
- 2 = Relay 2 (main relay)
- 3 = Relay 3 (camshaft energization)



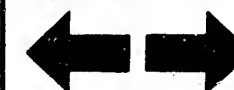
E5

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E6

Testing with universal test adapter
 Alfa Romeo Alfa 90



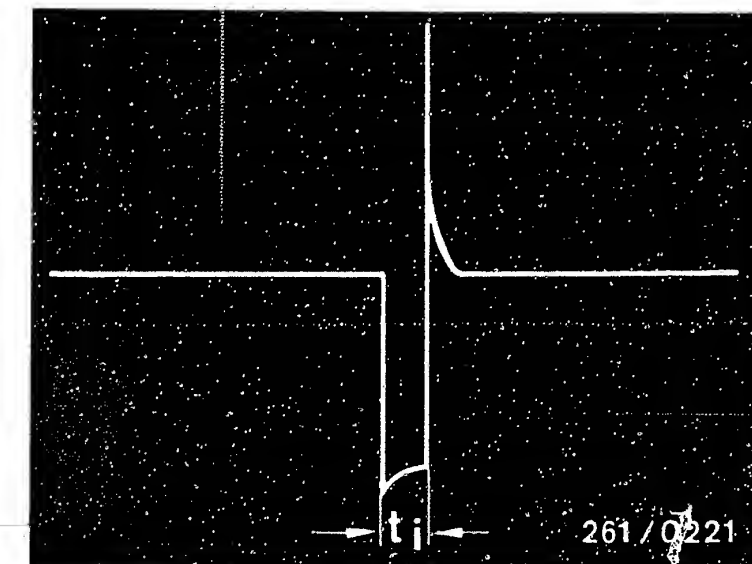
<u>Test step 32</u>		<u>Reading</u>	<u>Testing</u>
<u>Operation</u>			
<u>Program switch "V"</u> <u>at position:</u>	16	Injection signal (test output) present. (Upper illustration).	<u>Component:</u> Control unit
<u>Program switch "Ω"</u> <u>at position:</u>	15		
<u>Measuring equipment:</u> Motortester, oscilloscope			<u>Operation:</u> Injection signal at terminal 11 and ground
<u>Measuring range:</u> Special input			
<u>Connection:</u> Test wells; red clip to red well, black clip to black well			
<u>Operation in vehicle:</u> Shift gear to neutral and operate starting motor		If reading OK, continue testing with <u>next test step.</u>	<u>Malfunction:</u> No signal

Trouble-shooting:

Replace control unit.

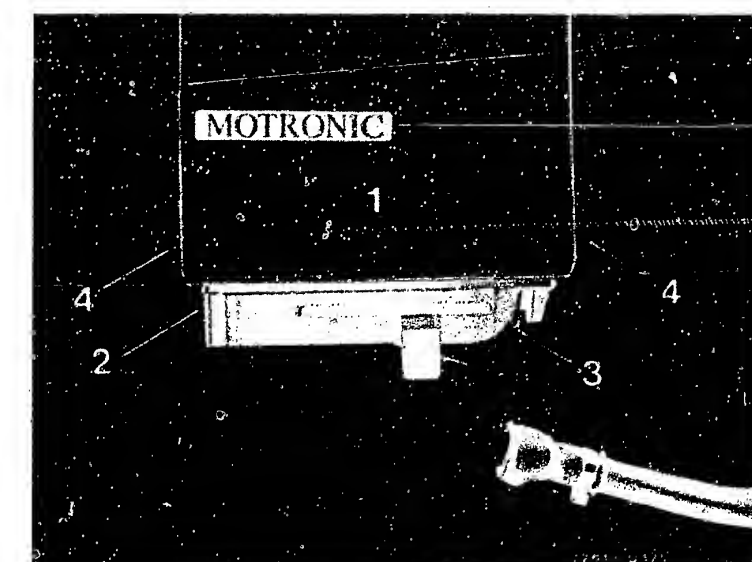
Note:

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins



Injection signal
 t_i = Duration of injection

- 1 = Control unit
- 2 = Locating lug
- 3 = Detent
- 4 = Mounting holes



E7

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E8

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Test step 33 Relay 1 (pump relay) connect.			
Operation		Reading	Testing
<u>Program switch "V" at position:</u>	17	Multimeter must indicate <u>10 ... 15 V</u>	<u>Component:</u> Relay 1 (pump relay)
<u>Program switch "Ω" at position:</u>	15		
<u>Measuring equipment':</u> Multimeter (V range)			
<u>Measuring range:</u> 15 V		If reading OK, continue testing with <u>next test step.</u>	<u>Operation:</u> Voltage at Term. 20 to ground
<u>Connection:</u> Test sockets; (red = +, black = ground)	V		<u>Malfunction:</u> Voltage less than 10 V
<u>Operation in vehicle:</u> Ignition on			

Testing

Component:

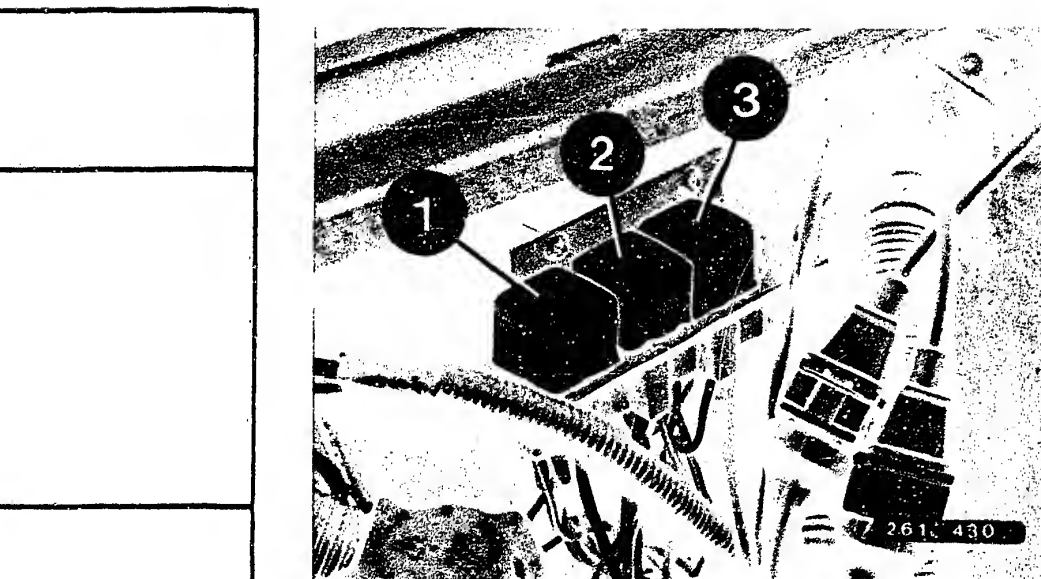
Relay 1
(pump relay)

Operation:

Voltage at Term. 20 to ground

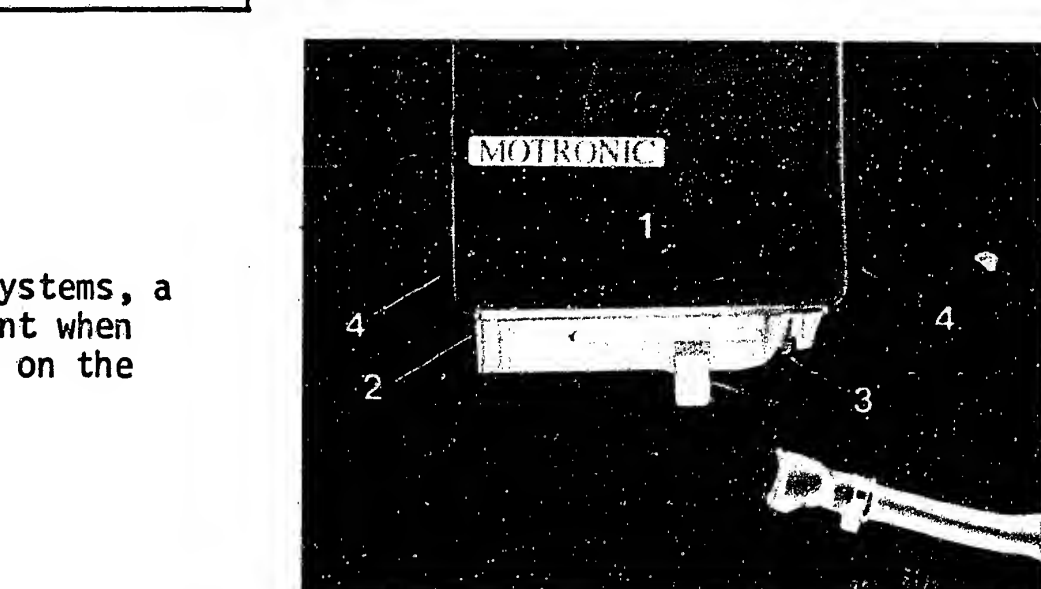
Malfunction:

Voltage less than 10 V



- 1 = Relay 1 (pump relay)
- 2 = Relay 2 (main relay)
- 3 = Relay 3 (camshaft energization)

- 1 = Control unit
- 2 = Locating lug
- 3 = Detent
- 4 = Mounting holes



Trouble-shooting:

- Replace relay 1.
- Check lead from control unit plug term. 20 to relay 1 term. 85.
- Replace control unit.

Note:

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.

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E10

Testing with universal test adapter
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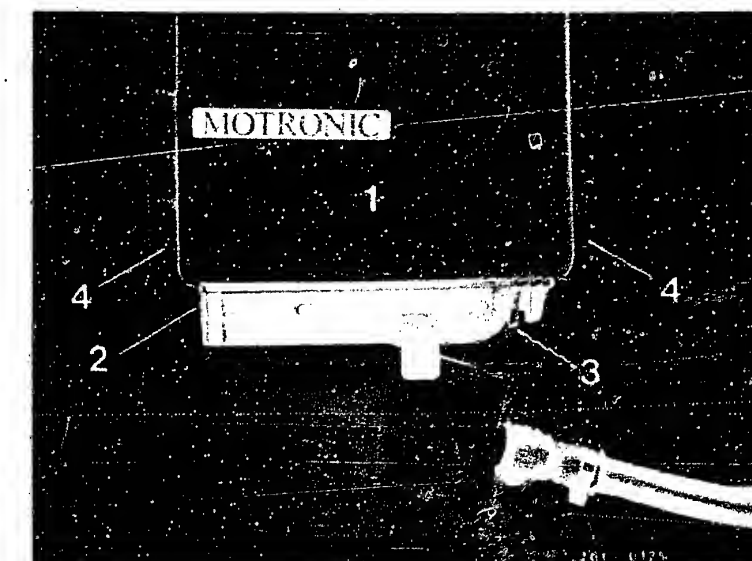
Test step 34			
Operation		Reading	Testing
<u>Program switch "V"</u> <u>at position:</u>	17	Multimeter must indicate <u>max. 4 V</u> <	

Trouble-shooting:

Replace control unit

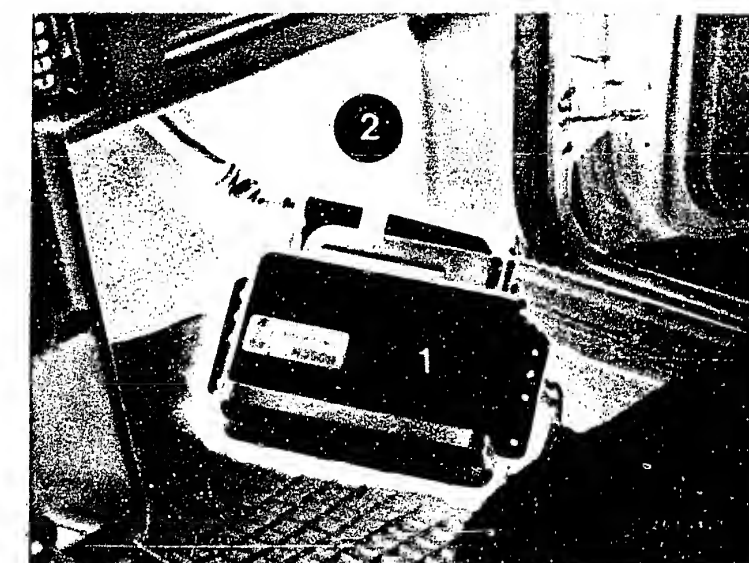
Note:

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.



- 1 = Control unit
- 2 = Locating lug
- 3 = Detenting
- 4 = Mounting holes

- 1 = Control unit
- 2 = Plastic cover



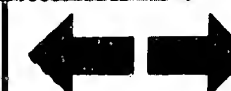
E11

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E12

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Test step 35			
Operation		Reading	Testing
<u>Program switch "V" at position:</u>	17	Pressure gauge must indicate <u>2.8 ... 3.2 bar</u>	<u>Component:</u> Pump relay, fuel pump, pressure regulator
<u>Program switch "Ω" at position:</u>	15		
<u>Measuring equipment:</u> Pressure gauge		If reading OK, continue testing with <u>next test step.</u>	<u>Operation:</u> Fuel pressure
<u>Measuring range:</u> 0 to 6 bar			
<u>Connection:</u> At test connection			
<u>Operation in vehicle:</u> Switch on ignition			
<u>Button:</u> Press T3			
			<u>Malfunction:</u> No fuel pressure or pressure outside tolerance

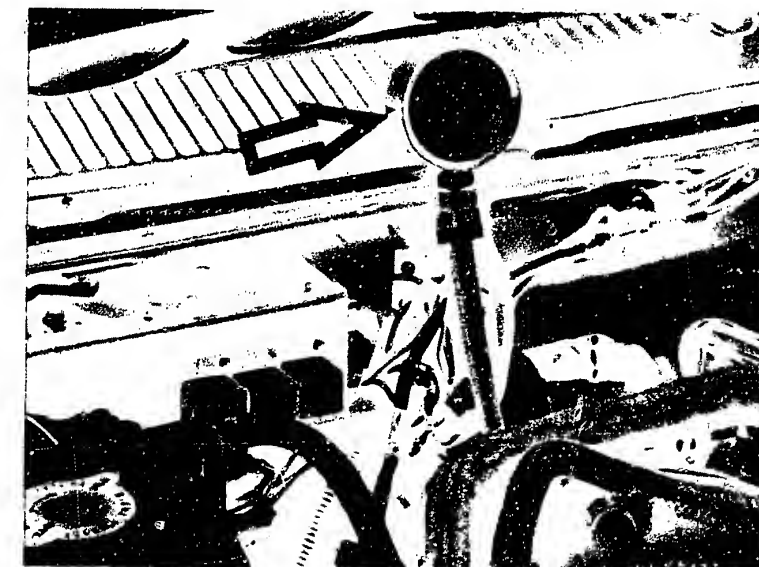
Note:

Install pressure gauge into fuel inlet to fuel-distribution pipe.

Caution!

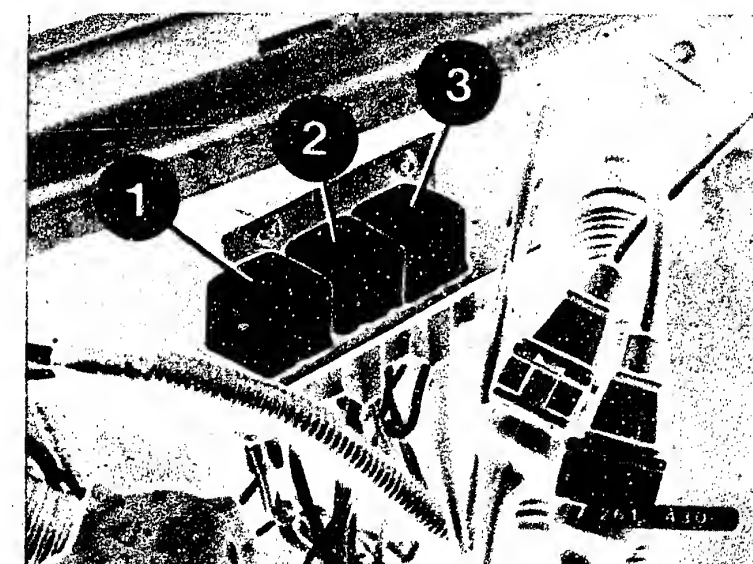
Catch escaping gasoline. Danger of fire with hot engine and electric sparks.

Continued on E15/E16



Arrow = Manometer

- 1 = Relay 1 (pump relay)
- 2 = Relay 2 (main relay)
- 3 = Relay 3 (camshaft energization)



E13

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E14

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Trouble-shooting - test step 35 (continued)

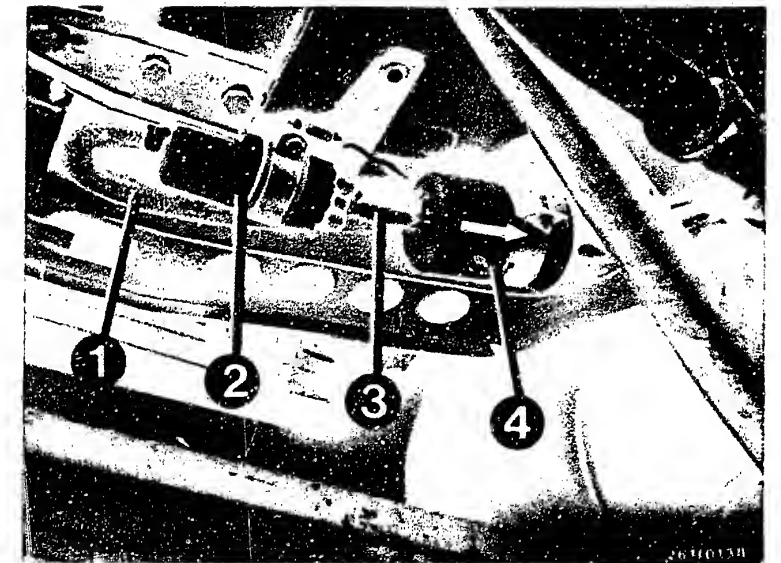
1. Pressure 0 bar, no pumping noises can be heard:

- Test pump fuse.
- Replace relay set.
- Measure voltage at disconnected pump plug.
If no voltage:
Test lead from fuel pump to pump relay term. 87 as well as pump ground lead.
- If voltage present:
Test pressure regulator and fuel pump, as described under 2. below.

2. Pressure outside tolerance, fuel pump operating:

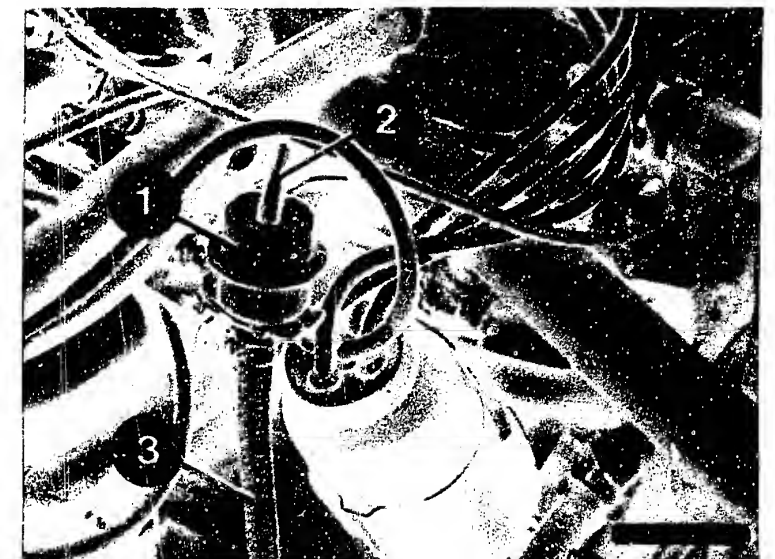
- Fuel pressure too low:
Slowly pinch off return line with hose clammer. If pressure rises above 4 bar, replace pressure regulator.
Pressure remains below 4 bar → replace fuel pump.

Continued on E17/E18



- 1 = Fuel intake line
 - 2 = Electric fuel pump
 - 3 = Fuel delivery line
 - 4 = Fuel filter
- Arrow = Direction of flow

- 1 = Pressure regulator
- 2 = To intake manifold
- 3 = Fuel return line



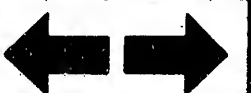
E15

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E16

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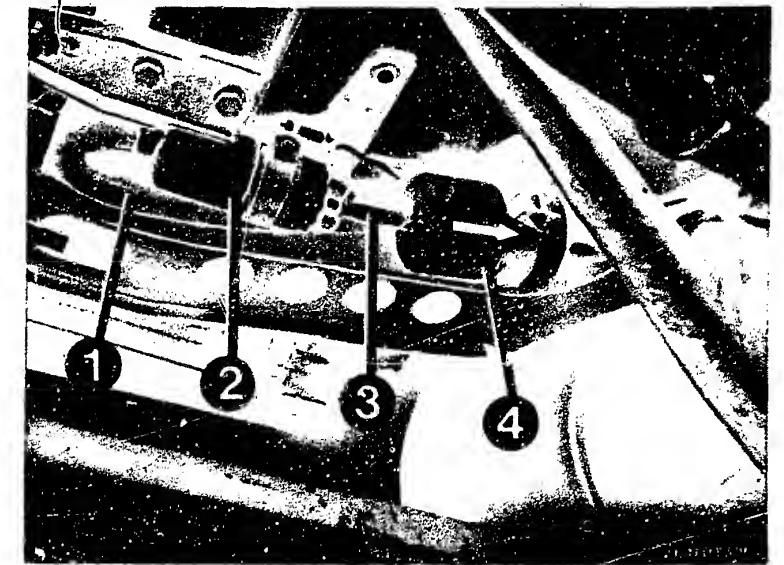


Trouble-shooting - test step 35 (continued)

- Check fuel line and fuel filter for throughflow. Fuel lines pinched?
- Strainer in tank clogged?
- Corrosion in tank?

3. Fuel pressure above 3.2 bar:

- Fuel return line clogged or pinched.
- Replace pressure regulator



1 = Fuel intake line
2 = Electric fuel pump
3 = Fuel delivery line
4 = Fuel filter
Arrow = Direction of flow

1 = Pressure regulator
2 = To intake manifold
3 = Fuel return line



E17

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E18

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CAUTION!

The following test steps can only be performed with the engine running.
If the engine will not run, continue with the trouble-shooting program of your choice.
Detailed trouble-shooting - see B3 - B4
Direct trouble-shooting - See B5 - B10
For further trouble-shooting, leave the test adapter, control unit and pressure gauge connected.

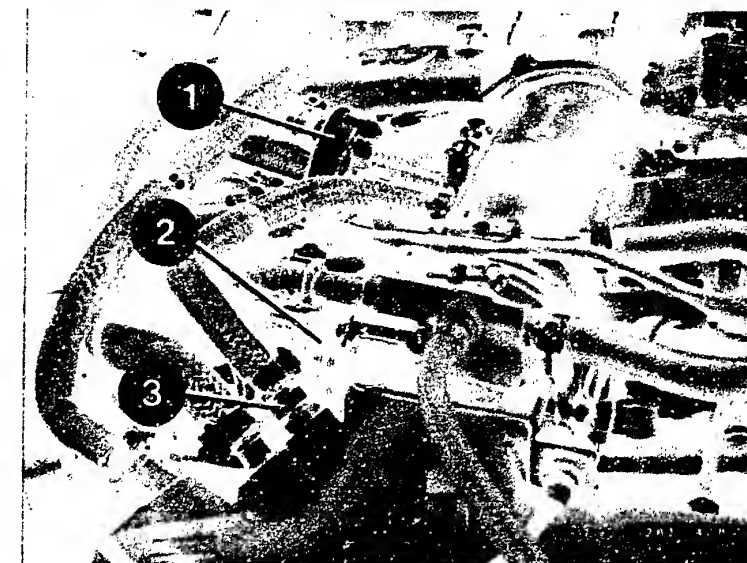
Test step 36 Connect motortester and CO analyzer

<u>Operation</u>		<u>Reading</u>	<u>Testing</u>
<u>Program switch "V" at position:</u>	17	1. With engine at normal operating temperature: <u>Idle speed:</u> 850 ... 950 min ⁻¹ <u>CO concentration:</u> 0.5 ... 1.5 by Vol.CO 2. Press button T2: Readings must not change.	<u>Component:</u> Engine, leaks in air-intake system
<u>Program switch "Ω" at position:</u>	15		
<u>Measuring equipment:</u> Motortester and CO analyzer			
<u>Measuring range:</u> Engine speed and CO			
<u>Connection:</u> Ignition coil, exhaust			<u>Operation:</u> Idle speed and exhaust
<u>Operation in vehicle</u> Allow engine to reach operating temperature		If reading OK, continue testing with <u>next test step.</u>	<u>Malfunction:</u> Readings outside tolerance

Trouble-shooting:

- Adjust idle speed at idle-speed-adjusting screw in throttle-valve assembly.

Continued on E21/E22



- 1 = Auxiliary-air device
- 2 = Throttle-valve switch
- 3 = Idle-speed adjusting screw

E19

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E20

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Trouble-shooting - test step 36 (continued)

- Adjust the exhaust using the idle-mixture-adjusting screw in the air-flow sensor. To do this, remove the plug in the air-flow sensor. After finishing the adjustment, use a new plug (red).

Turning the idle-mixture-adjusting screw in a clockwise direction:

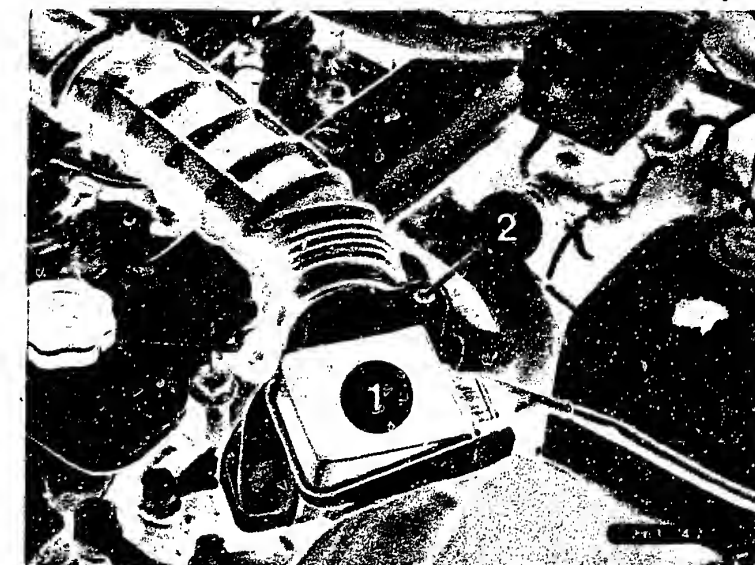
Increases the CO concentration.

Turning the idle-mixture-adjusting screw in a counterclockwise direction:

Reduces the CO concentration.

CO concentration less than 0.5 % by vol. CO and not adjustable:

Check the intake side and the exhaust system for leaks (unmetered air) by means of pressure test.



1 = Air-flow sensor with NTC I

2 = Idle-mixture-adjusting screw

Concerning 2.

If the readings change after pressing button T2, the engine is not yet at normal operating temperature.

E21

Testing with universal test adapter
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E22

Testing with universal test adapter
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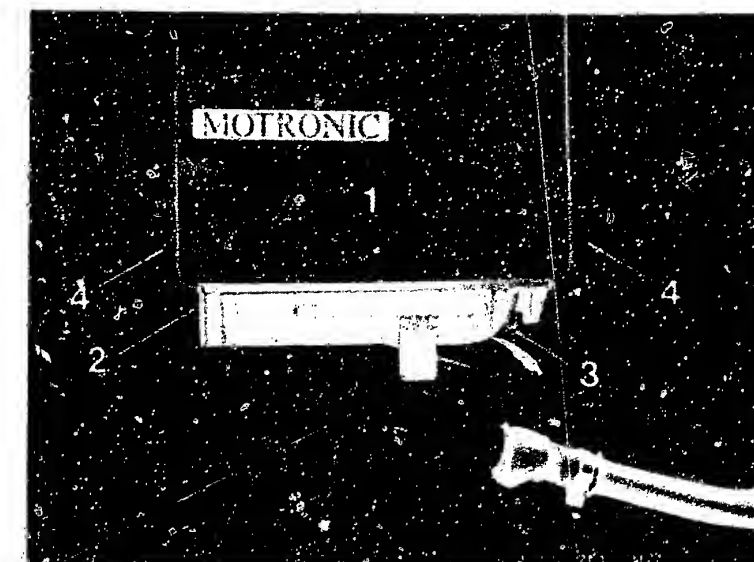
Test step 37		Note: For Sweden/Switzerland version connect term. 10 from control unit to ground (term. 5).	
Operation		Reading	Testing
Program switch "Y" at position:	17	1. Spark advance with engine at operating temperature and at idle speed: 5°...15°	Component: Control unit
Program switch "Ω" at position:	15		
Measuring equipment: Motortester		Switzerl./Sweden-version - 5...+5°	Operation: Spark advance at idle and at full load
Measuring range: Spark advance		2. Set engine speed to 2600 min ⁻¹ and only then press button T6 (full load): For all vehicles: Spark advance 13°...23°	Malfunction: Spark advance outside tolerance
Connection: Timing light			
Operation in vehicle: Allow engine to reach operating temperature.		If reading OK, continue testing with next test step.	

Trouble-shooting:

- Concerning 1. (above): Check idle speed accurately once again, and repeat test step. Idle speed must be between 850 ... 950 min⁻¹, otherwise a different spark advance will be indicated.
- Concerning 2.: Bring engine up to stated engine speed once again and read off spark advance
- Replace control unit

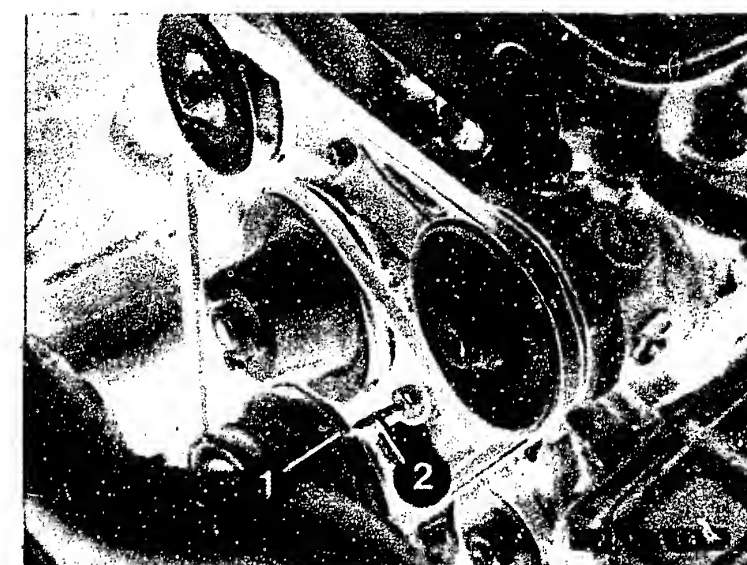
Note:

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.



- 1 = Control unit
- 2 = Locating lug
- 3 = Detent
- 4 = Mounting holes

- 1 = Movable ignition-duration-point marking "P" on V-belt pulley (corresponds to TDC)
- 2 = Pin as fixed marking



E23

Testing with universal test adapter

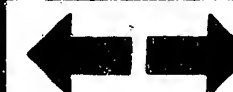
Alfa Romeo Alfa 90



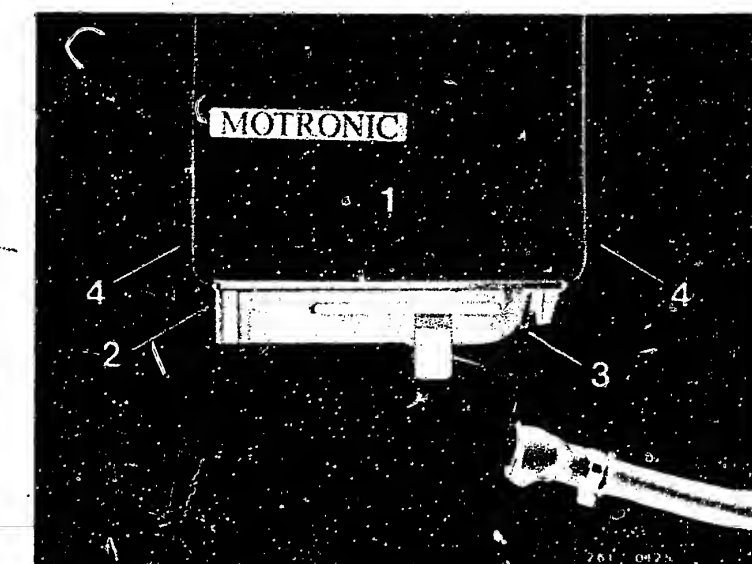
E24

Testing with universal test adapter

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Test step 38			
Operation		Reading	Testing
<u>Program switch "V" at position:</u>	17	1. With engine at normal operating temperature and at idle speed: <u>8°...18°</u> 2. At 3000 min ⁻¹ <u>25...45°</u> <u>Note:</u> Measure dwell angle at ignition coil (term.1) If reading OK, continue testing with next test step.	<u>Component:</u> Control unit
<u>Program switch "Ω" at position:</u>	15		
<u>Measuring equipment:</u> Motortester			<u>Operation:</u> Dwell angle
<u>Measuring range:</u> Dwell angle			
<u>Connection:</u> Ignition coil			<u>Malfunction:</u> Dwell angle outside tolerance
<u>Operation in vehicle:</u> Let engine run			



- 1 = Control unit
- 2 = Locating lug
- 3 = Detent
- 4 = Mounting holes

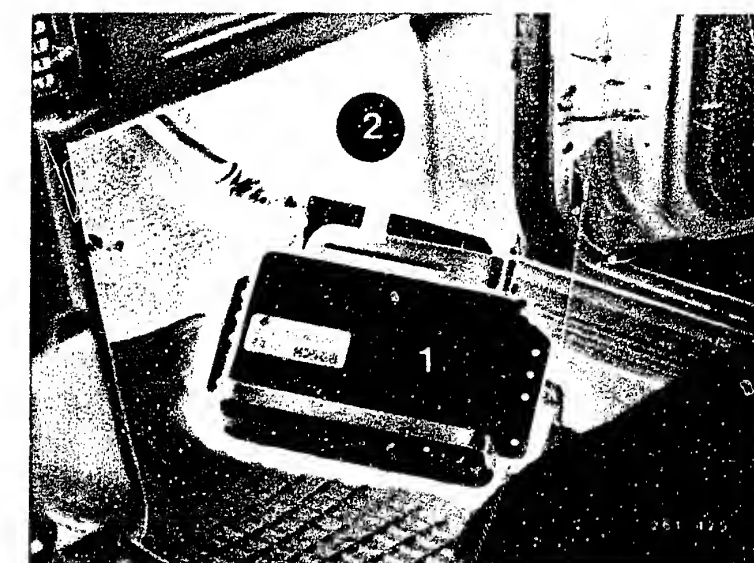
- 1 = Control unit
- 2 = Plastic cover

Trouble-shooting:

Replace control unit

Note:

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.



F1

Testing with universal test adapter
Alfa Romeo Alfa 90

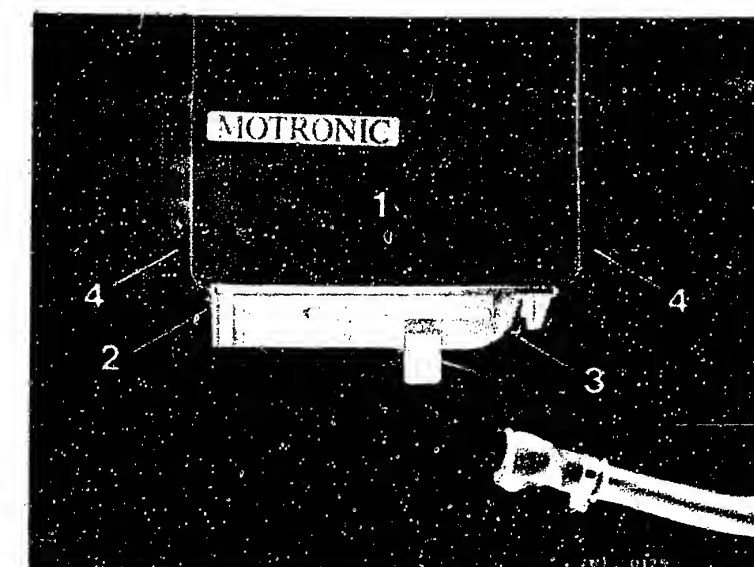


F2

Testing with universal test adapter
Alfa Romeo Alfa 90

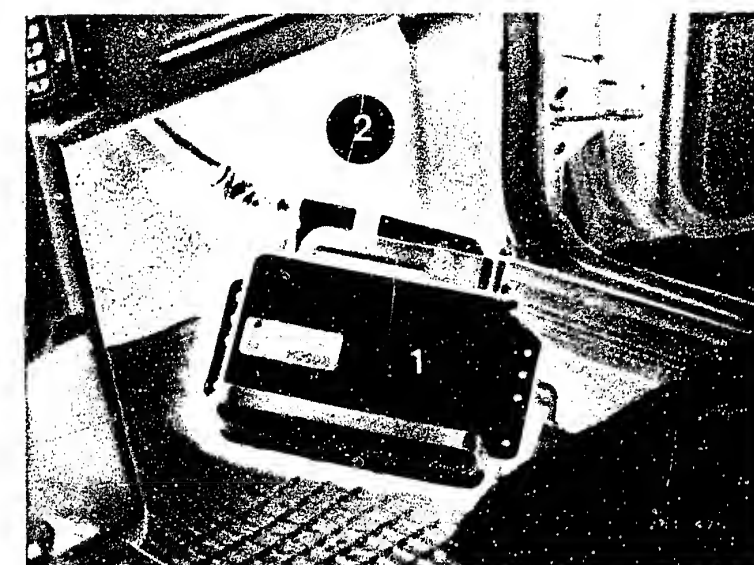


Test step 39			
Operation		Reading	Testing
<u>Program switch "V" at position:</u>	17	Engine at normal operating temperature Engine speed 2000 min ⁻¹ (keep accelerator in same position). Press button T5:	<u>Component:</u> Control unit
<u>Program switch "Ω" at position:</u>	15		
<u>Measuring equipment:</u> Motortester		<u>Engine "hunts"</u> i.e. Engine speed drops to approx. 900 - 1200 min ⁻¹ . Engine speed then rises again and drops again etc. If reading OK, continue testing with next test step.	<u>Operation:</u> Cutting off of injection pulses (overrun cutoff) <u>Malfunction:</u> No cutoff
<u>Measuring range:</u> Engine speed			
<u>Connection:</u> Ignition coil			
<u>Operation in vehicle:</u> Let engine run			
<u>Button:</u> Press T5			



- 1 = Control unit
- 2 = Locating lug
- 3 = Detent
- 4 = Mounting holes

- 1 = Control unit
- 2 = Plastic cover



Trouble-shooting:

Replace control unit

Note:

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.

F3

Testing with universal test adapter
Alfa Romeo Alfa 90

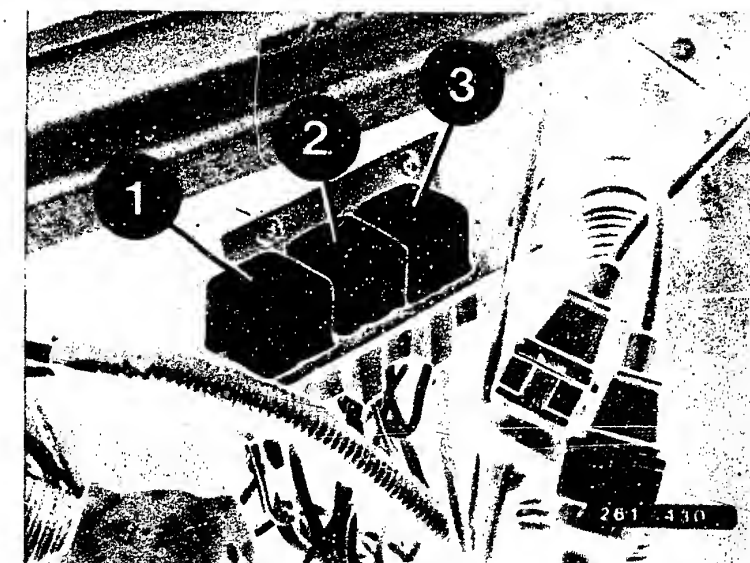


F4

Testing with universal test adapter
Alfa Romeo Alfa 90

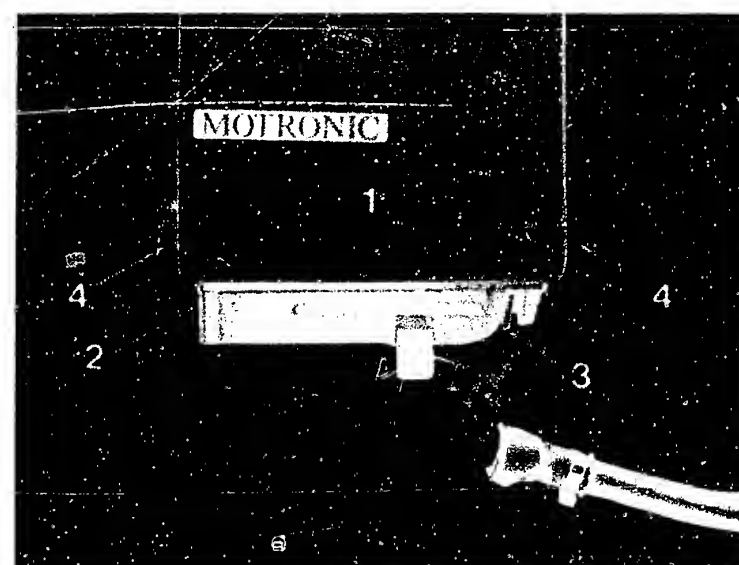


TEST STEP 40:		
Operation		Reading
Program switch "V" at position:	17	1. Voltage at idle speed
Program switch "Ω" at position:	15	10...15 V
Measuring equipment: Voltmeter		2. Set engine speed to 2000...3000 min ⁻¹ and press button T6 (full load). Voltage:
Measuring range: 15 V		max. 4 V
Connection: Test sockets (red = +, black = ground)	V	3. At idle speed press button T6: <u>Engine runs rough or stops.</u>
Operation in vehicle: Ignition on. Operate engine at idle speed.		



- 1 = Relay 1 (pump relay)
2 = Relay 2 (main relay)
3 = Relay 3 (camshaft energization)

- 1 = Control unit
2 = Locating lug
3 = Detent
4 = Mounting holes



Trouble-shooting:

1. Replace relay 3.
Check lead from control unit plug term. 31 to relay 3 term. 85.
Test lead from relay 3 term. 86 to relay 1 (pump relay) term. 87.
2. Replace control unit.

Note:

In order to rule out any confusion between the control units of the various systems, a mechanical locking device has been introduced. The "locating lug" (pivot point when opening and connecting the control unit) and the corresponding mounting point on the control unit have matching recesses and pins.

3. Replace solenoid-operated valve for camshaft energization.

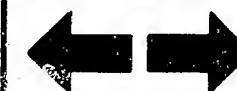
F5

Testing with universal test adapter
Alfa Romeo Alfa 90



F6

Testing with universal test adapter
Alfa Romeo Alfa 90



Testing with the Universal test adapter is now completed.
If the fault has not been found or if you require
further information and instructions on how to remedy
the fault, continue with the trouble-shooting program
of your choice.

Detailed trouble-shooting → see B3-B4
Direct trouble-shooting → see B5-B10

F7

Testing with universal test adapter

Alfa Romeo Alfa 90



STARTING MOTOR OPERATES, ENGINE FAILS TO START OR STARTS ONLY WITH GREAT DIFFICULTY

11. TROUBLE-SHOOTING PROGRAM ACCORDING TO CUSTOMER COMPLAINT

How to use the following trouble-shooting program

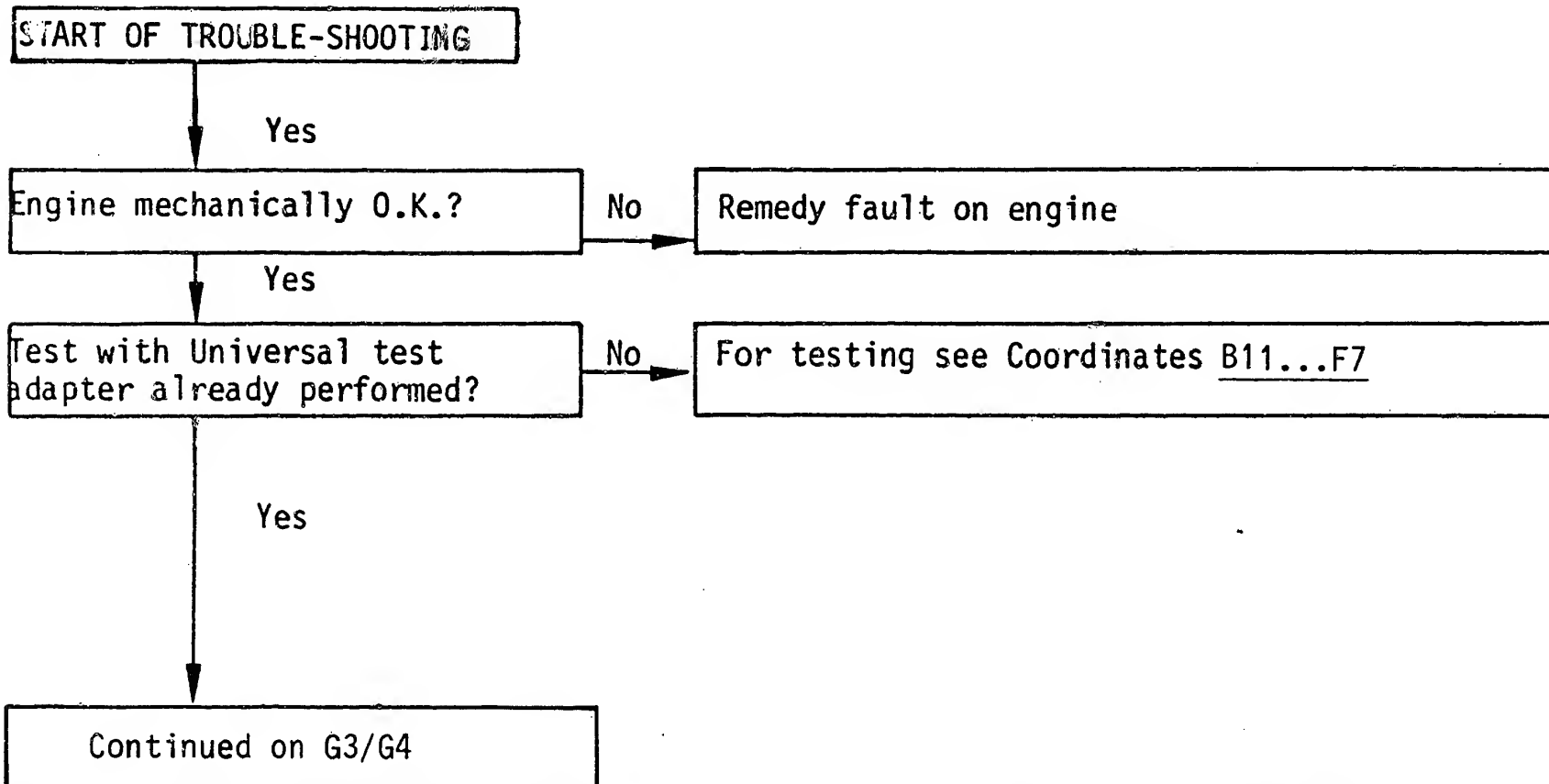
The program is divided into 3 rows of boxes:

1. The left-hand row contains the questions on the tests.
2. The middle row contains descriptions of the testing and adjustment operations on the components.
3. The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.



G1

Engine fails to start
Alfa Romeo Alfa 90



G2

Engine fails to start
Alfa Romeo Alfa 90



Starting motor operates, engine fails to start or starts only with great difficulty
(continued)

Yes

Check secondary pattern of all cylinders at cranking speed. Secondary pattern O.K.?

No

Check ignition coil and high-voltage part. Check distributor cap for dirt and insulation damage.

Adjusting the high-voltage distributor:

Remove distributor cap. Set flywheel to TDC (P). Bring housing notch of high-voltage distributor into alignment with center of distributor rotor.

When connecting the H.T. ignition cables, note the cylinder numbers. Do not forget screening cover. Check ignition coil primary for continuity (approx. 0 Ω). Secondary resistance: 5 to 7.2 k Ω . Test interference-suppression resistors, ignition cables and spark plugs.

Interference-suppression resistor in

Distributor rotor:

1 k Ω

Distributor outer dome:

1 k Ω

Distributor center dome:

1 k Ω

Spark-plug connector:

5 k Ω

Ignition coil:

0 k Ω

Yes

While cranking, feel all injection valves by hand. Can needle movement be felt on all valves?

No

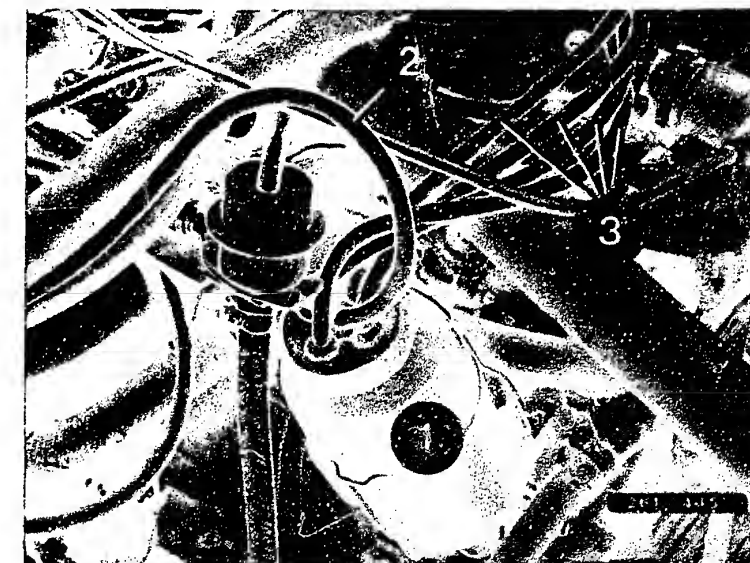
Test injection valve with ohmmeter.

Test specification: 15 to 17,5 Ω

Replace injection valve if defective.

Yes

Continued on G5/G6



- 1 = High-voltage distributor
- 2 = High-voltage cable to ignition coil
- 3 = Ignition leads

G3

Engine fails to start

Alfa Romeo Alfa 90



G4

Engine fails to start

Alfa Romeo Alfa 90



Starting motor operates, engine fails to start or starts only with great difficulty
(continued)

yes

Solenoid-operated injection
valve mechanically O.K.?
(Continued)

no

Removing the injection valves

Loosen fastening screws of injection valves. Remove electric connections.

Pull fuel-distribution pipe upward until the injection valves are out of the bore in the intake manifold.

Do not damage nozzle needle or rubber seals.

Test nozzle needle and surroundings for leaks and deposits.

Break open hose-termination sleeves (1) of injection valves.

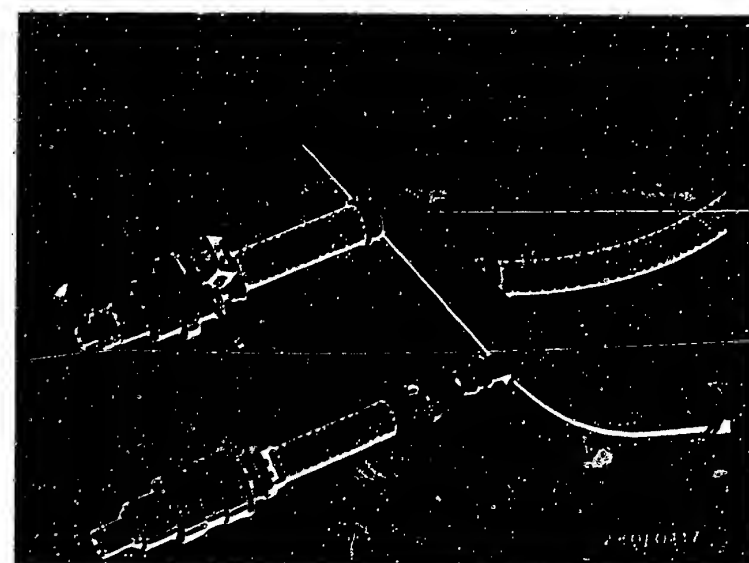
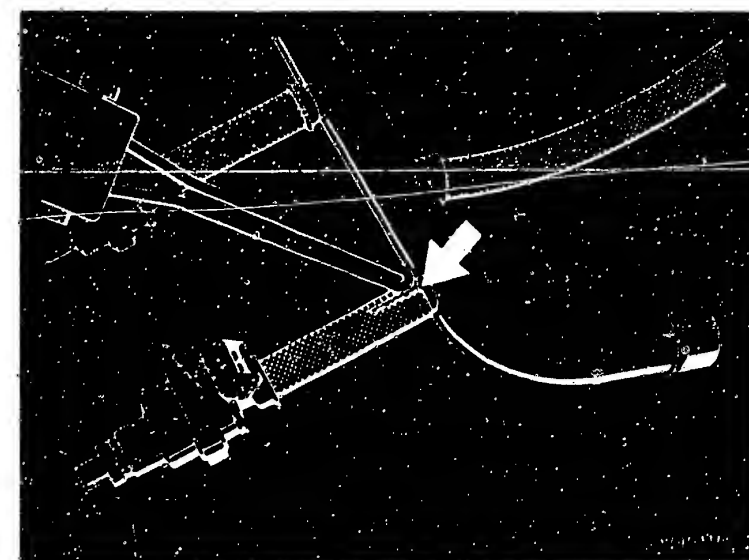
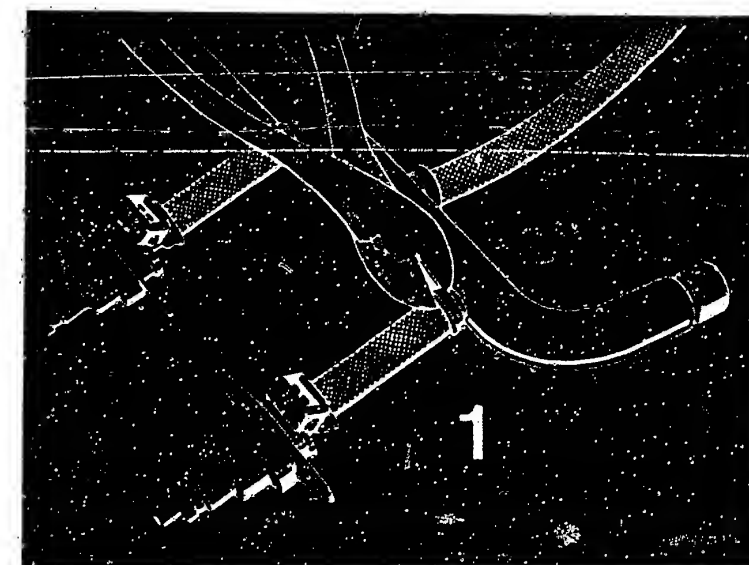
Using soldering iron or soldering gun, cut open fuel hose in longitudinal direction and pull off.

Fit new injection valve with hose-termination sleeve. To do this, wet hose inside with fuel and push onto fitting as far as it will go. Note installation position of connector.

yes

Continued on G9/G10

Continued on G7/G8



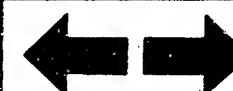
G5

Engine fails to start
Alfa Romeo Alfa 90



G6

Engine fails to start
Alfa Romeo Alfa 90



Starting motor operates, engine fails to start or starts only with great difficulty
(continued)

yes

1. Removing the hose

- The fasteners on the injection valve (O-ring) need not be removed.
- Place injection valve (2) in clamping fixture 1 688 120 093 (1) and clamp in vise.
- Cut open hose-termination sleeve with side cutters and remove.
- Cut open the hose lengthways using a soldering iron or soldering gun and pull off.

2. Installing the hose

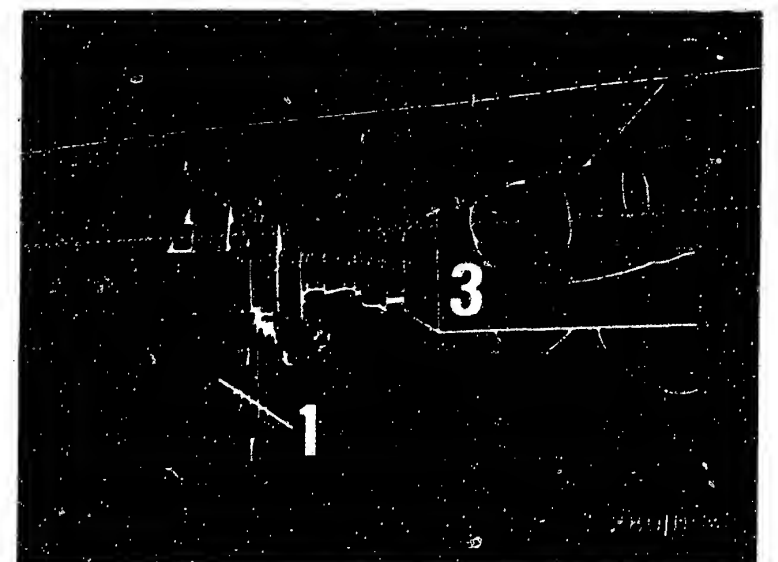
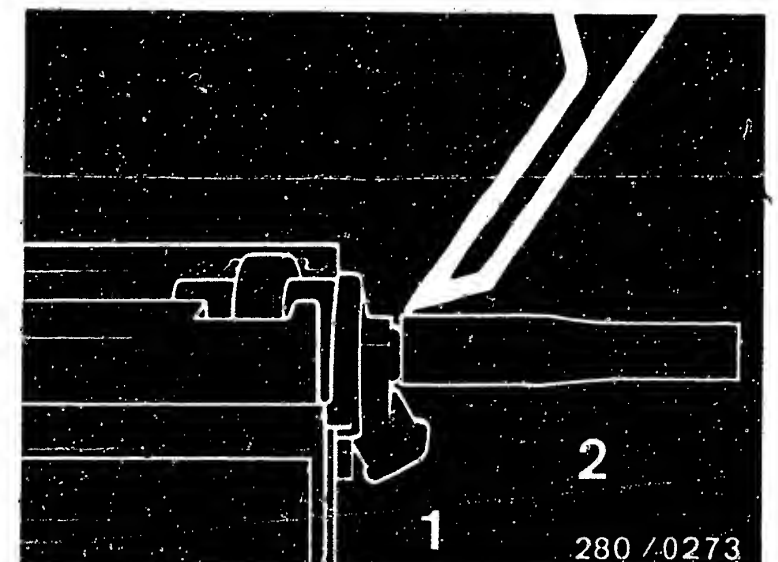
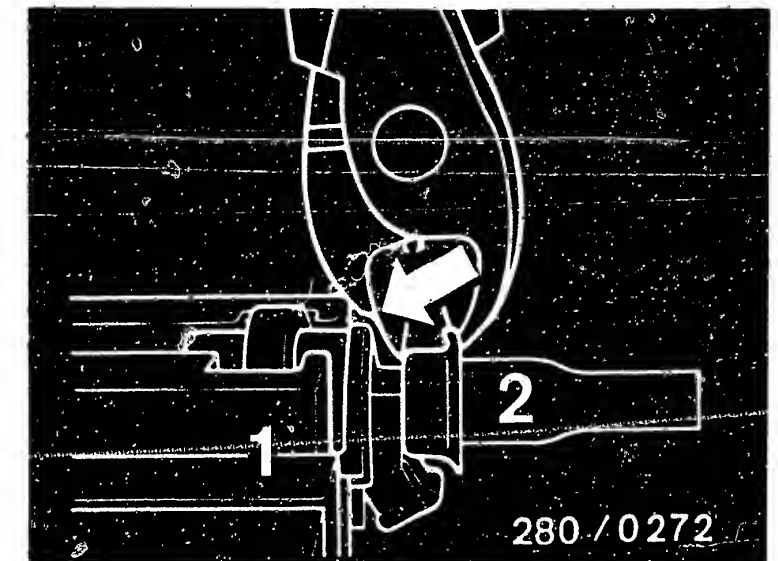
Parts set 1 287 010 701 is required for installation.

- Clean outside of tailpiece.
- Wet new fuel hose with fuel or calibrating oil.
- Press hose and hose-termination sleeve by hand as far as they will go onto the tailpiece using assembly mandrel 1 687 931 003 (3).
Hose-termination sleeve must then be tight.

Caution! Do not use hose clamp on tailpiece of injection valve.

Installing the injection valves

Make sure that the two rubber seals are properly seated on each injection valve. Replace defective seals. Press all 4 injection valves with the fuel-delivery line uniformly into the seats and secure. Make sure there are no air leaks. Plug on electrical connections and air hoses.



Continued on G9/G10

G7

Engine fails to start
Alfa Romeo Alfa 90



G8

Engine fails to start
Alfa Romeo Alfa 90



Starting motor operates, engine fails to start or starts only with great difficulty
(continued)

yes

Auxiliary-air device tested?

no

Testing (mechanical):

1. Visual examination of auxiliary-air device:

Remove hoses and look down, using a small mirror. When cold, the device must be open; when the engine is warm, it must be closed. If not, replace auxiliary-air device.

2. Functional test of auxiliary-air device:

With the engine cold, pinch off hose to auxiliary-air device. Engine speed must drop. With the engine warm, pinch off hose to auxiliary-air device. Engine speed must not drop. If incorrect, replace auxiliary-air device (pay attention to direction of flow).

3. Electrical test

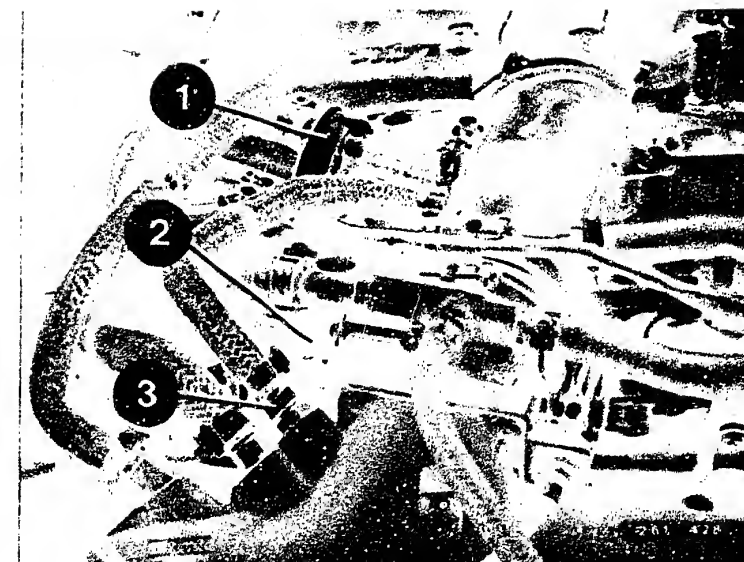
Remove plug from auxiliary-air device. Connect ohmmeter to both terminals of the auxiliary-air device.

Test values: 25 ... 60 Ω

If a value outside the tolerance is shown, replace the auxiliary-air device.

yes

Continued on G11/G12



1 = Auxiliary-air device

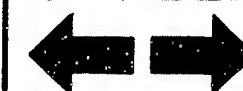
G9

Engine fails to start
Alfa Romeo Alfa 90



G10

Engine fails to start
Alfa Romeo Alfa 90



Starting motor operates, engine fails to start or starts only with great difficulty
(continued)

Yes

Air-flow sensor mechanically
O.K.?

No

Testing: Open air-flow sensor flap by hand. It must be possible to open the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. When the air-flow sensor flap is opened it must not catch at any point. Watch for any indications of abrasion or rubbing. Clean air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are any signs of abrasion or rubbing, replace the air-flow sensor.

Yes

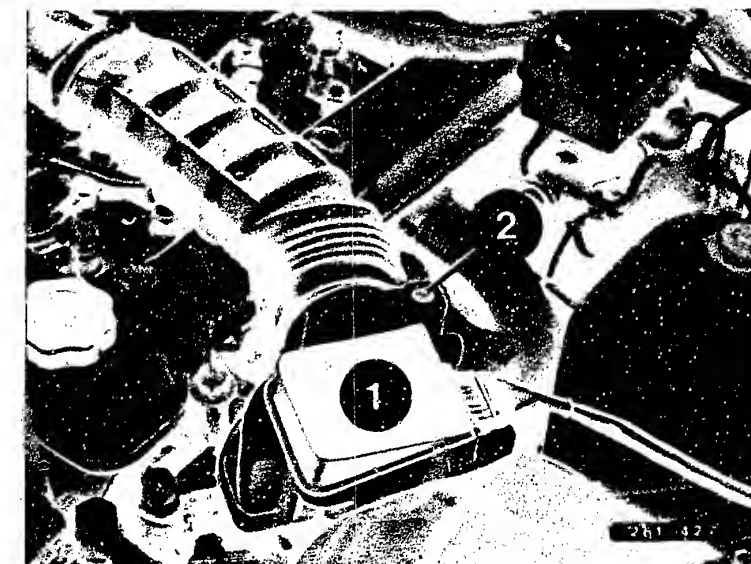
Are all hose lines and electric
leads securely attached?
Visual examination.
Is the air-intake system leak-
tight?

No

Check whether hoses of air-intake system and of fuel line system are securely attached, not kinked or damaged. If necessary, replace hoses. Eliminate leaks with new seals or by re-tightening the connecting screws.
Leak test: Seal off exhaust tail pipe. Open air filter and seal off air-flow sensor duct. Pull off hose after auxiliary-air device and blow air (approx. 0.3 bar gauge pressure) into the intake manifold with a compressed-air gun. Seal off connection port on auxiliary-air device. Open throttle valve fully while doing this. Brush or spray all joints with leak-detector spray or soapy water. Bubbling or foaming indicates a leak. Check electrical plug-in contacts for loose contact. Spring contacts in the connectors must not allow themselves to be pushed back.

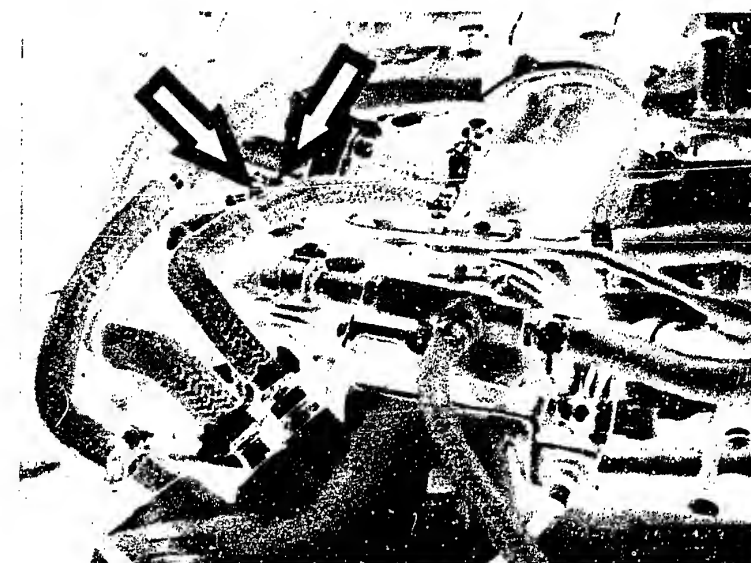
Yes

Continued on G13/G14



1 = Air-flow sensor with NTC I
2 = Idle-mixture-adjusting screw

Arrows = Ground leads



G11

Engine fails to start
Alfa Romeo Alfa 90



G12

Engine fails to start
Alfa Romeo Alfa 90



Starting motor operates, engine fails to start or starts only with great difficulty
(continued)

Yes

Testing completed for customer complaint

"Starting motor operates, engine fails to start or starts only with great difficulty",

Customer complaint remedied?

No

Further possibilities

- Customer complaint incorrectly diagnosed (see Coordinates B3...B10). If the fault has not be detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinates B3/B4).
- Engine not mechanically O.K. (Compression, valve setting, valve timing, worn camshaft).

G13

Engine fails to start
Alfa Romeo Alfa 90



G14

Engine fails to start
Alfa Romeo Alfa 90



ENGINE STARTS BUT THEN DIES

Trouble-shooting program according to customer complaints

How to use the following trouble-shooting program

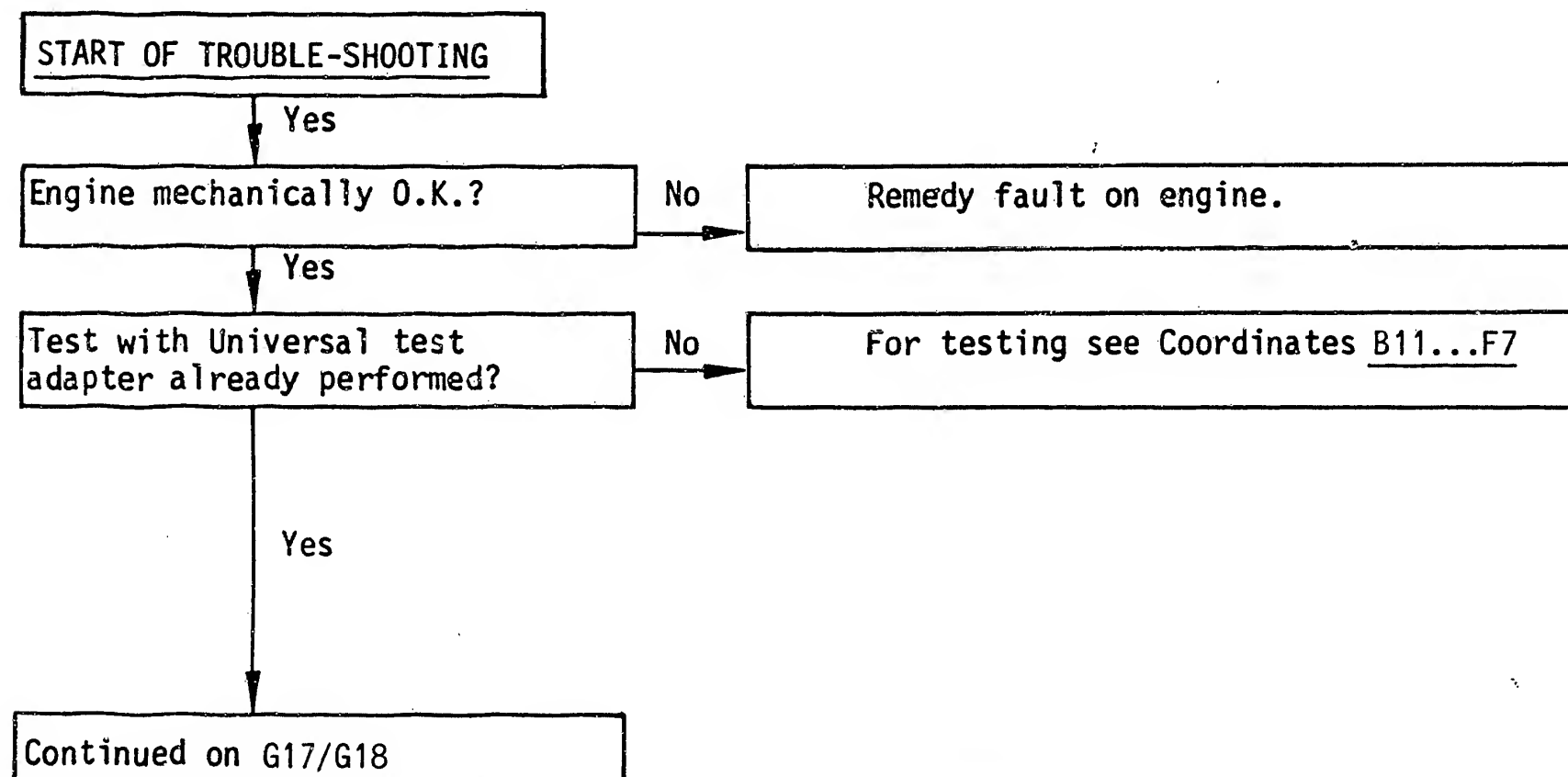
The program is divided into 3 rows of boxes:

1. The left-hand row contains the questions on the tests.
2. The middle row contains descriptions of the testing and adjustment operations on the components.
3. The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continued trouble-shooting at the point at which you branched off.



G15

Engine starts but then dies

Alfa Romeo Alfa 90



G16

Engine starts but then dies

Alfa Romeo Alfa 90



Engine starts but then dies (continued)

Yes

Are all hose lines and electric leads securely attached?
Visual examination.
Is the air-intake system leak-tight?

No

Check whether hoses of air-intake system and of fuel line system are securely attached, not kinked or damaged. If necessary, replace hoses. Eliminate leaks with new seals or by re-tightening the connecting screws.
Leak test: Seal off exhaust tail pipe. Open air filter and seal off air-flow sensor duct. Pull off hose after auxiliary-air device and blow air (approx. 0.3 bar gauge pressure) into the intake manifold with a compressed-air gun. Seal off connection port on auxiliary-air device. Open throttle valve fully while doing this. Brush or spray all joints with leak-detector spray or soapy water. Bubbling or foaming indicates a leak. Check electrical plug-in contacts for loose contact. Spring contacts in the connectors must not allow themselves to be pushed back.

Yes

Continued on G19/G20

G17

Engine starts but then dies
Alfa Romeo Alfa 90



G18

Engine starts but then dies
Alfa Romeo Alfa 90



Engine starts but then dies (continued)

Yes

Auxiliary-air device
tested?

No

Testing (mechanical):

1. Visual examination of auxiliary-air device

Remove hoses and look down, using a small mirror. When cold, the device must be open; when the engine is warm, it must be closed. If not, replace auxiliary-air device.

2. Functional test of auxiliary-air device

When engine is cold, disconnect hose to auxiliary-air device. Engine speed must drop. When engine is warm, disconnect hose to auxiliary-air device. Engine speed must not drop. If not replace auxiliary-air device (observe direction of flow).

3. Electrical test

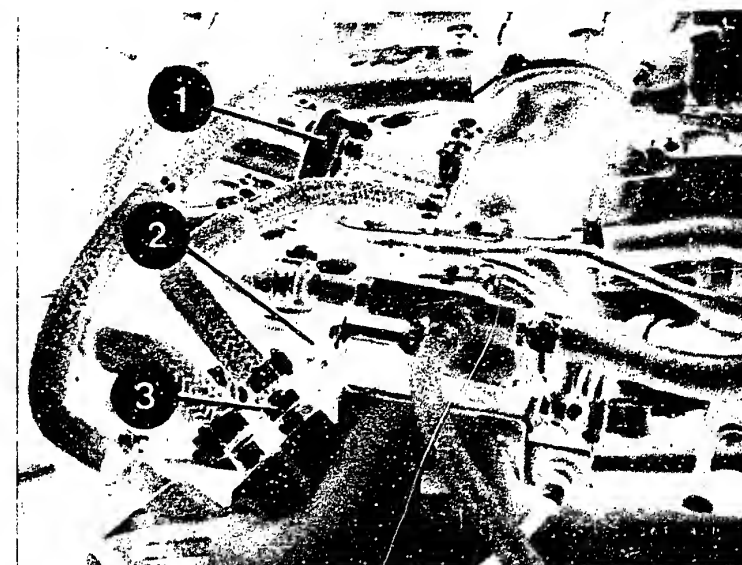
Disconnect plug of auxiliary-air device. Connect ohmmeter to both terminals of the auxiliary-air device.

Test values: 25 ... 60 Ω

If a value outside tolerance is shown, replace auxiliary-air device.

Yes

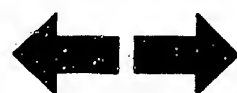
Continued on G21/G22



1 = Auxiliary-air device

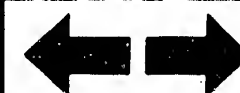
G 19

Engine starts but then dies
Alfa Romeo Alfa 90



G 20

Engine starts but then dies
Alfa Romeo Alfa 90



Engine starts but then dies (continued)

Yes

Is air-flow sensor in good mechanical condition?

No

Testing: Open air-flow sensor flap by hand. It must be possible to open the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. When the air-flow sensor flap is opened it must not catch at any point. Watch for any indications of abrasion or rubbing. Clean air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are any signs of abrasion or rubbing, replace the air-flow sensor.

Yes

Testing completed for customer complaint

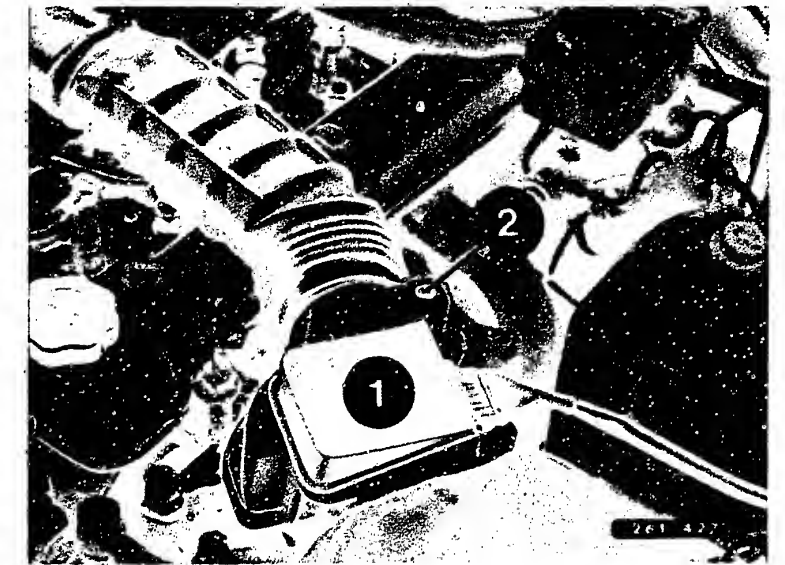
"Engine starts but then dies".

Customer complaint remedied?

No

Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates B3...B10). If the fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinates B3/B4).
- Engine not mechanically O.K. (Compression, valve setting, valve timing, worn camshaft).



1 = Air-flow sensor with NTC I
2 = Idle-mixture-adjusting screw

G21

Engine starts but then dies

Alfa Romeo Alfa 90



G22

Engine starts but then dies

Alfa Romeo Alfa 90



UNEVEN ENGINE IDLE, SPEED ADJUSTMENT (IDLE) AND EXHAUST-GAS ADJUSTMENT

Trouble-shooting program according to customer complaints

How to use the following trouble-shooting program

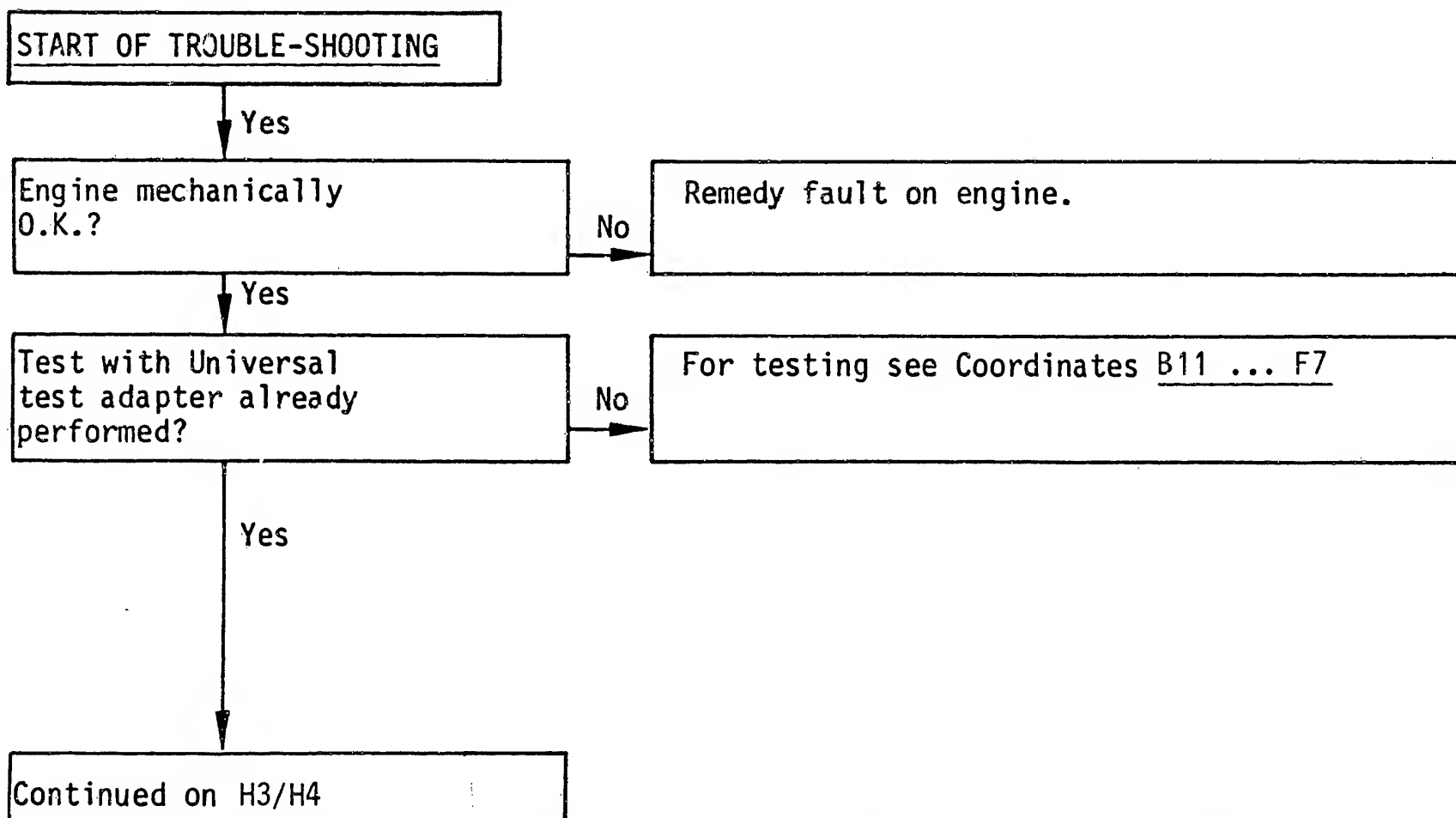
The program is divided into 3 rows of boxes:

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3. The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.



H1

Uneven engine idle
Alfa Romeo Alfa 90



H2

Uneven engine idle
Alfa Romeo Alfa 90



Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (continued)

Yes

Check secondary pattern of all cylinders at cranking speed. Secondary pattern O.K.?

No

Check ignition coil and high-voltage part. Check distributor cap for dirt and insulation damage.

Adjusting the high-voltage distributor:

Remove distributor cap. Set flywheel to TDC (P). Bring housing notch of high-voltage distributor into alignment with center of distributor rotor.

When connecting the H.T. ignition cables, note the cylinder numbers. Do not forget screening cover. Check ignition coil primary for continuity (approx 0 Ω). Secondary resistance: 5 to 7.2 k Ω . Test interference-suppression resistors, ignition cables and spark plugs.

Interference-suppression resistor in

Distributor rotor:	1 k Ω
Distributor outer dome:	1 k Ω
Distributor center dome:	1 k Ω
Spark-plug connector:	5 k Ω
Ignition coil:	0 k Ω

Yes

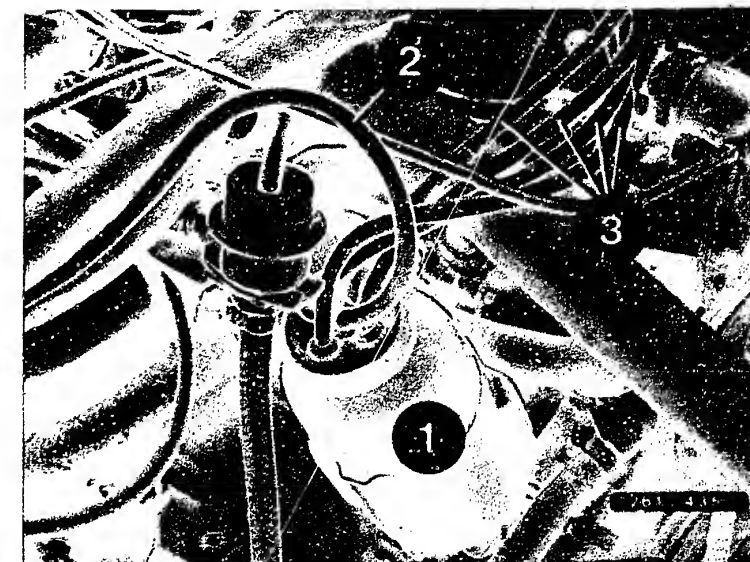
Is air-flow sensor in good mechanical condition?

No

Testing: Open air-flow sensor flap by hand. It must be possible to open the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. When the air-flow sensor flap is opened it must not catch at any point. Watch for any indications of abrasion or rubbing. Clean air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are any signs of abrasion or rubbing, replace the air-flow sensor.

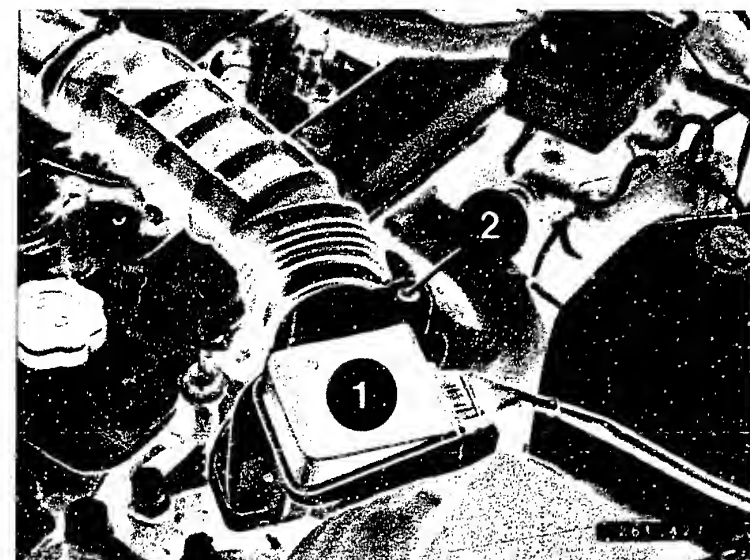
Yes

Continued on H5/H6



- 1 = High-voltage distributor
- 2 = High-voltage cable to ignition coil
- 3 = Ignition leads

- 1 = Air-flow sensor with NTC I
- 2 = Idle-mixture-adjusting screw



H3

Uneven engine idle
Alfa Romeo Alfa 90



H4

Uneven engine idle
Alfa Romeo Alfa 90



Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (continued)

yes

Are all hose lines and electric leads securely attached?
Visual examination.
Is the air-intake system leak-tight?

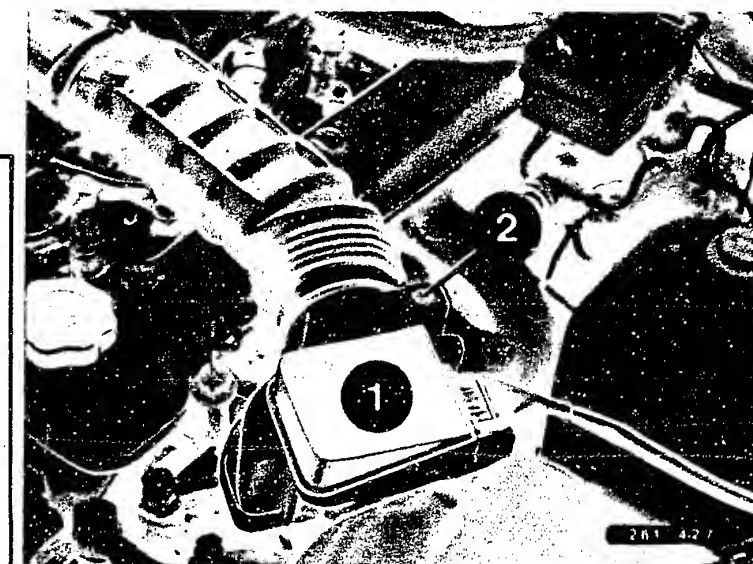
no

Check whether hoses of air-intake system and of fuel line system are securely attached, not kinked or damaged. If necessary, replace hoses. Eliminate leaks with new seals or by re-tightening the connecting screws.

Leak test: Seal off exhaust tail pipe. Open air filter and seal off air-flow sensor duct.

Pull off hose after auxiliary-air device and blow air (approx. 0.3 bar gauge pressure) into the intake manifold with a compressed-air gun. Seal off connection port on auxiliary-air device.

Open throttle valve fully while doing this. Brush or spray all joints with leak-detector spray or soapy water. Bubbling or foaming indicates a leak. Check electrical plug-in contacts for loose contact. Spring contacts in the connectors must not allow themselves to be pushed back.



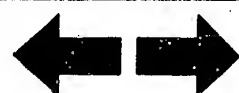
1 = Air-flow sensor with NTC I
2 = Idle-mixture-adjusting screw

yes

Continued on H7/H8

H5

Uneven engine idle
Alfa Romeo Alfa 90



H6

Uneven engine idle
Alfa Romeo Alfa 90



Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (continued)

Yes

Auxiliary-air device
tested?

No

Testing (mechanical):

1. Visual examination of auxiliary-air device:
Remove hoses and look down, using a small mirror. When cold, the device must be open when the engine is warm, it must be closed. If not, replace auxiliary-air device.

2. Functional test of auxiliary-air device:
With the engine cold, pinch off hose to auxiliary-air device. Engine speed must drop. With the engine warm, pinch off hose to auxiliary-air device. Engine speed must not drop. If incorrect, replace auxiliary-air device (pay attention to direction of flow).

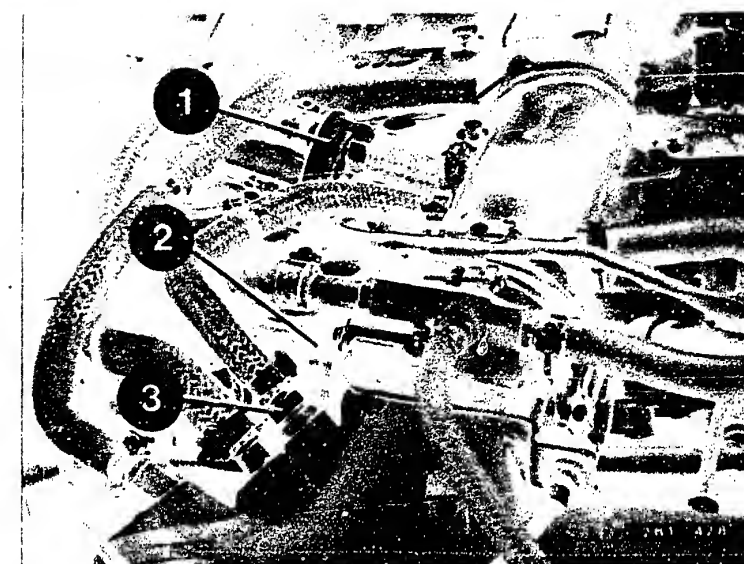
3. Electrical test
Disconnect plug of auxiliary-air device. Connect ohmmeter to both terminals of the auxiliary-air device.

Test values: 25 ... 60 Ω

If a value outside the tolerance is shown, replace the auxiliary-air device.

Yes

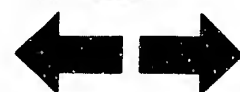
Continued on H9/H10



1 = Auxiliary-air device

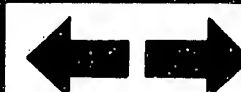
H7

Uneven engine idle
Alfa Romeo Alfa 90



H8

Uneven engine idle
Alfa Romeo Alfa 90



Uneven engine idle, speed adjustment (idle) and exhaust-gas adjustment (continued)

Solenoid-operated injection valve mechanically O.K.?

yes

no

With the engine running, disconnect injection-valve connectors individually, one after the other, from injection valves and plug on again. Engine speed must drop if injection valve O.K.. If not, replace injection valve.

Removing the injection valves

Loosen fastening screws of injection valves. Remove electric connections.

Pull fuel-distribution pipe upward until the injection valves are out of the bore in the intake manifold.

Do not damage nozzle needle or rubber seals.

Test nozzle needle and surroundings for leaks and deposits.

Break open hose-termination sleeves (1) of injection valves.

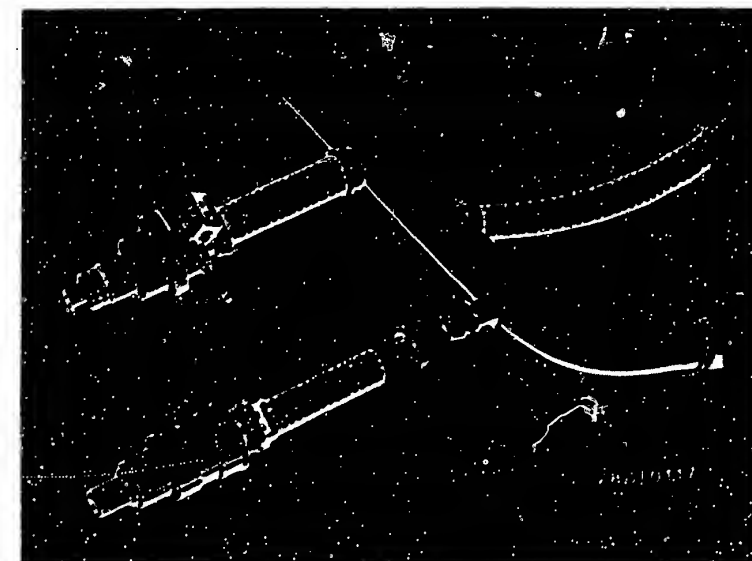
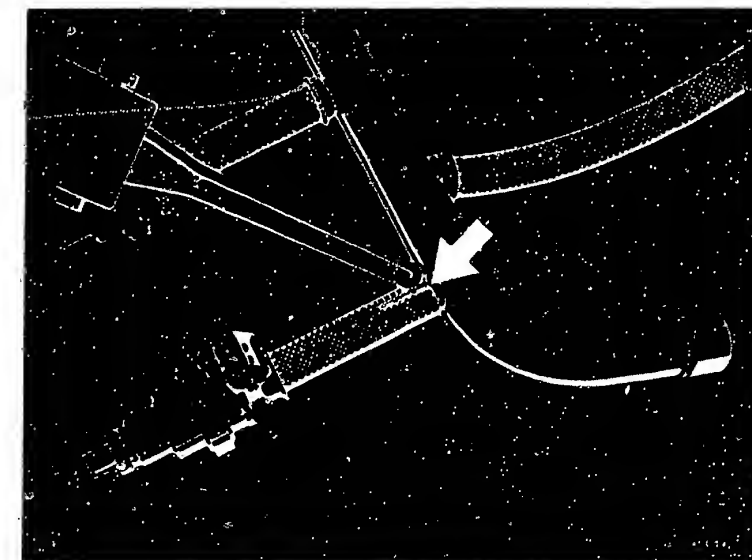
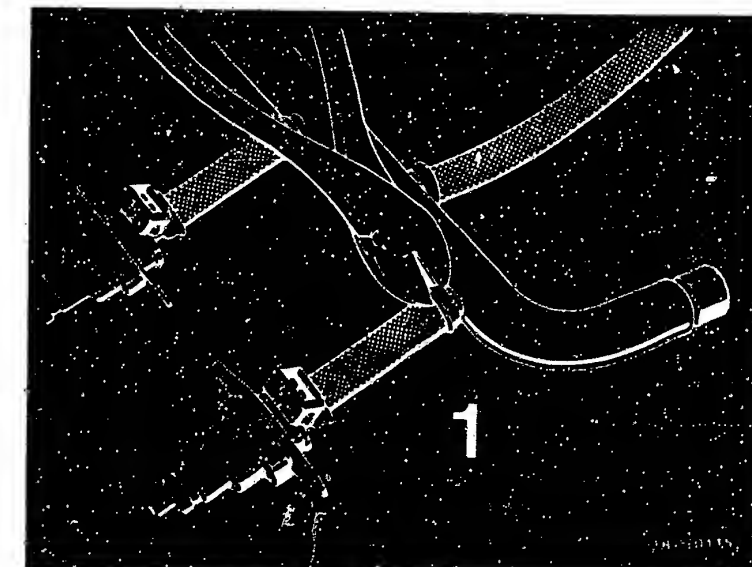
Using soldering iron or soldering gun, cut open fuel hose in longitudinal direction and pull off.

Fit new injection valve with hose-termination sleeve. To do this, wet hose inside with fuel and push onto fitting as far as it will go. Note installation position of connector.

yes

Continued on H13/H14

Continued on H11/H12



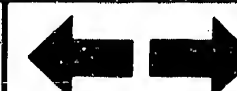
H9

Uneven engine idle
Alfa Romeo Alfa 90



H10

Uneven engine idle
Alfa Romeo Alfa 90



yes

Continued on H13/H14

1. Removing the hose

- The fasteners on the injection valve (O-ring) need not be removed.
- Place injection valve (2) in clamping fixture 1 688 120 093 (1) and clamp in vise.
- Cut open hose-termination sleeve with side cutters and remove.
- Cut open the hose lengthways using a soldering iron or soldering gun and pull off.

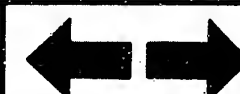
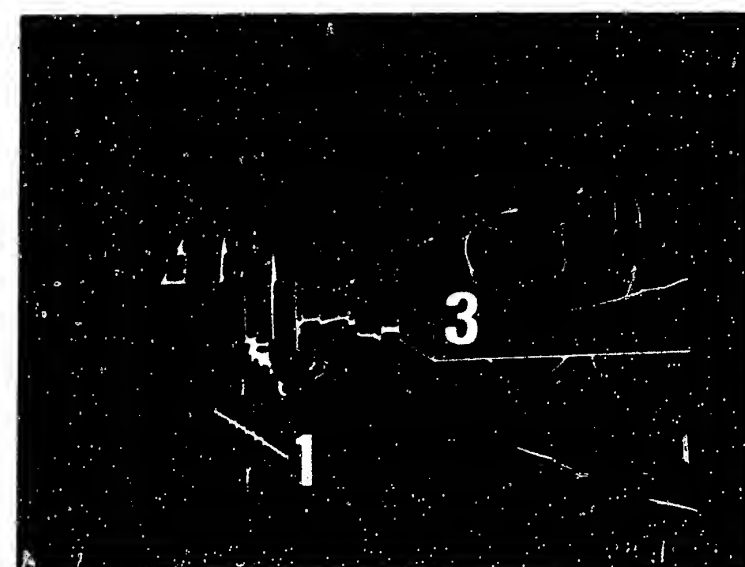
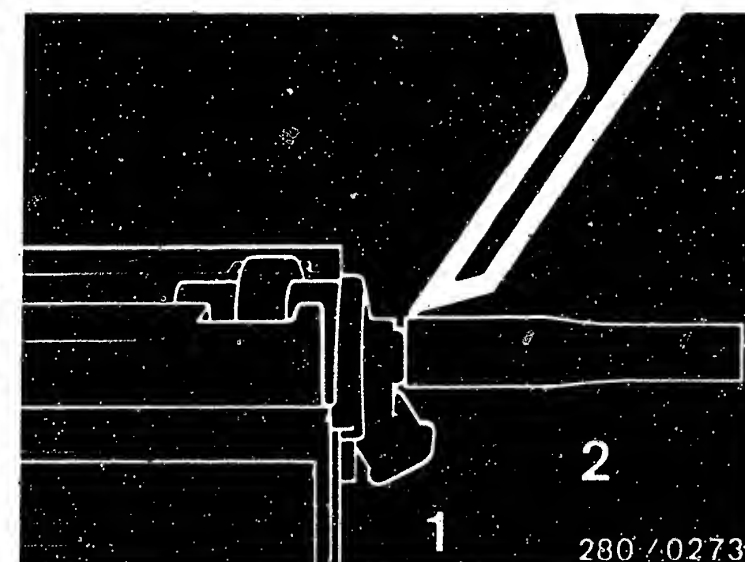
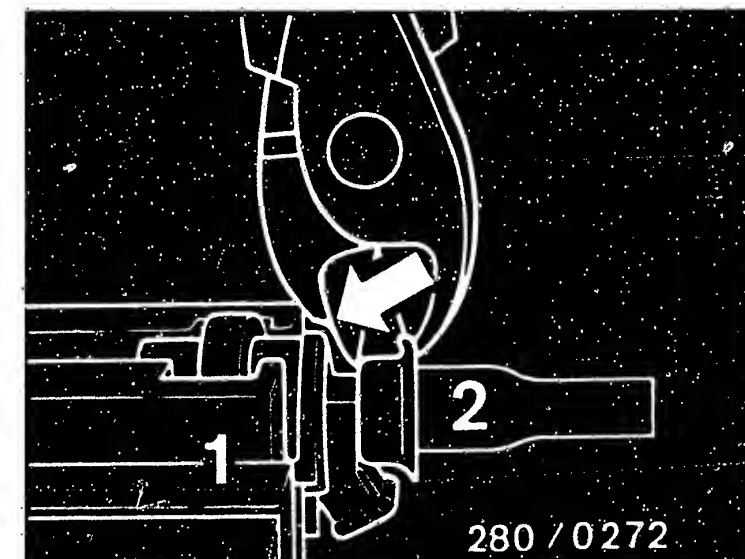
2. Installing the hose

- Parts set 1 287 010 701 is required for installation.
- Clean outside of tailpiece.
- Wet new fuel hose with fuel or calibrating oil.
- Press hose and hose-termination sleeve by hand as far as they will go onto the tailpiece using assembly mandrel 1 687 931 003 (3). Hose-termination sleeve must then be tight.

Caution! Do not use hose clamp on tailpiece of injection valve.

Installing the injection valves

Make sure that the two rubber seals are properly seated on each injection valve. Replace defective seals. Press all 4 injection valves with the fuel-delivery line uniformly into the seats and secure. Make sure there are no air leaks. Plug on electrical connections and air hoses.



Uneven engine idle, speed adjustment (idle), and exhaust-gas adjustment (continued)

yes

Is camshaft actuation OK?
(Bucking in lower part-load
range)

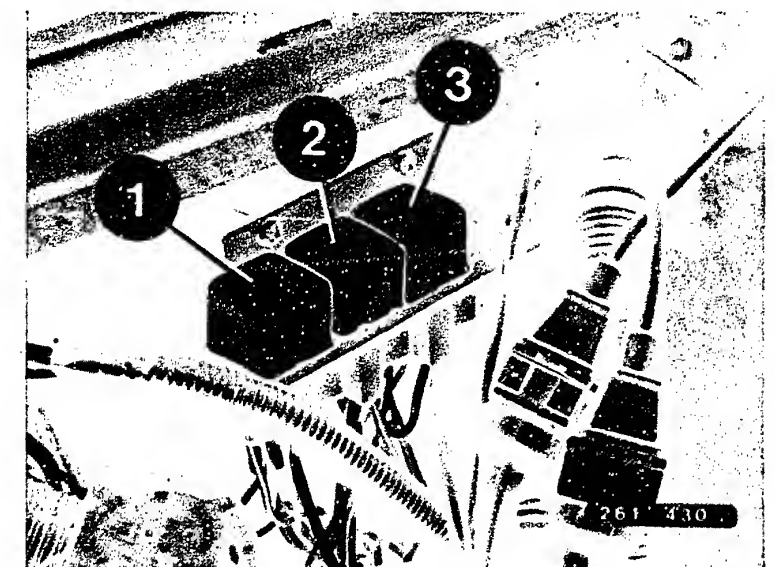
no

Check relay 3 (camshaft actuation):

- The relay spool with leads has already been tested with the test adapter.
- Switch on ignition and measure voltage at relay 3/term. 87. Nominal value approx. 0 V, i.e. no current flow between term. 30 and term. 87 (see circuit diagram).
- Wiring harness OK?
Pull off relay 3 and measure voltage at term. 87 again with ignition on:
Nominal value approx. 0 V.
- Is solenoid-operated valve connected at relay 3/term. 87? There must be no voltage present at the solenoid-operated valve (ignition on).

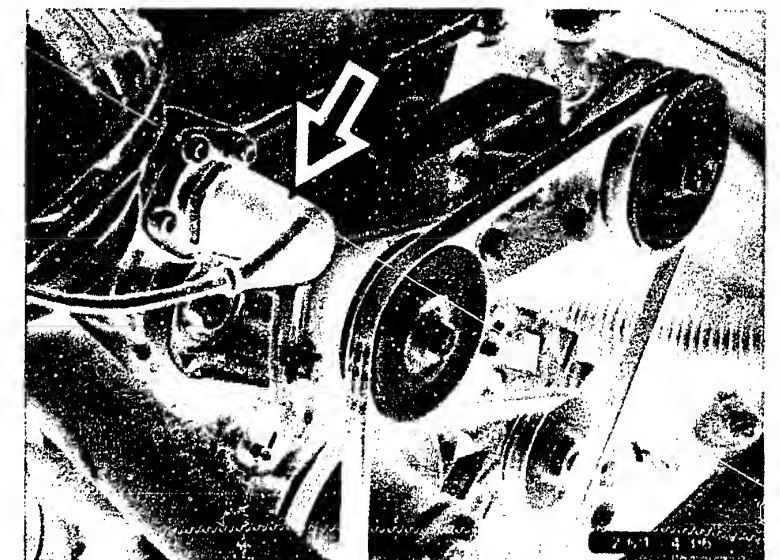
yes

Continued on H15/H16



- 1 = Relay 1 (pump relay)
2 = Relay 2 (main relay)
3 = Relay 3 (camshaft actuation)

Arrow = Solenoid-operated valve



H13

Uneven engine idle
Alfa Romeo Alfa 90



H14

Uneven engine idle
Alfa Romeo Alfa 90



Uneven engine idle, speed adjustment (idle) and exhaust-gas test (continued)

Yes

With engine at normal operating temperature, set idle speed with idle screw to

850...950 min⁻¹

With engine at normal operating temperature, set CO adjusting screw to

0.5...1.5 % by vol. CO

Yes

Testing completed for customer complaint

"Uneven engine idle".

Customer complaint remedied?

No

- Set idle speed at idle adjustment screw in throttle-valve fitting.
- Set exhaust gas with mixture-adjustment screw in air-flow sensor. To do this remove the plug.

If CO cannot be adjusted:

- CO concentration too low: Repeat leak test on air-intake system.
- CO concentration too high: Replace air-flow sensor.

Note: Use new plug (red) in air-flow sensor after CO adjustment.

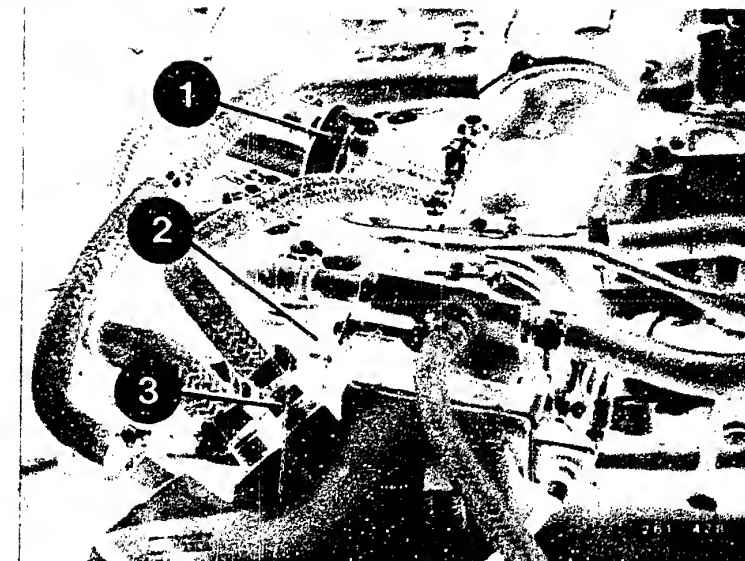
No

Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates B3...B10).

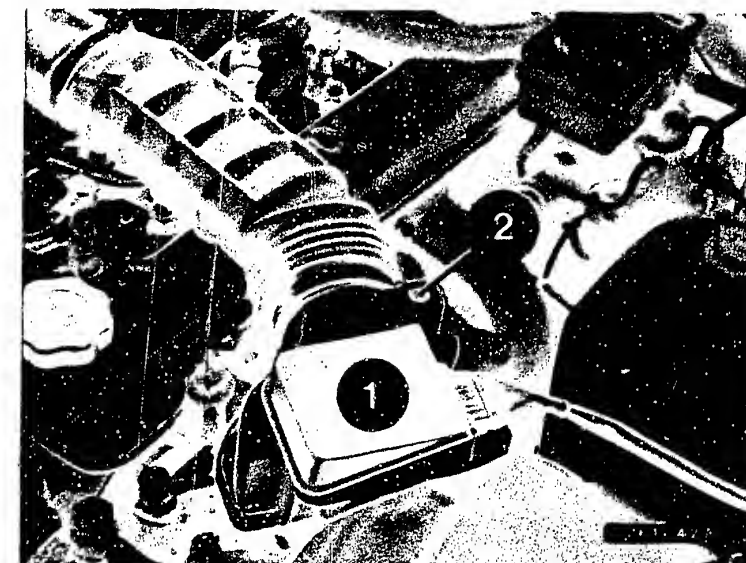
If the fault has not been detected by "direct trouble-shooting", see "detailed trouble shooting" (Coordinates B3/B4).

- Engine not mechanically O.K. (compression, valve setting, valve timing, worn camshaft).



3 = Idle-speed adjusting screw

1 = Air-flow sensor with NTC I
2 = Idle-mixture-adjusting screw



H15

Uneven engine idle
Alfa Romeo Alfa 90



H16

Uneven engine idle
Alfa Romeo Alfa 90



POOR THROTTLE TAKE-UP

Trouble-shooting program according to customer complaints

How to use the following trouble-shooting program

The program is divided into 3 rows of boxes:

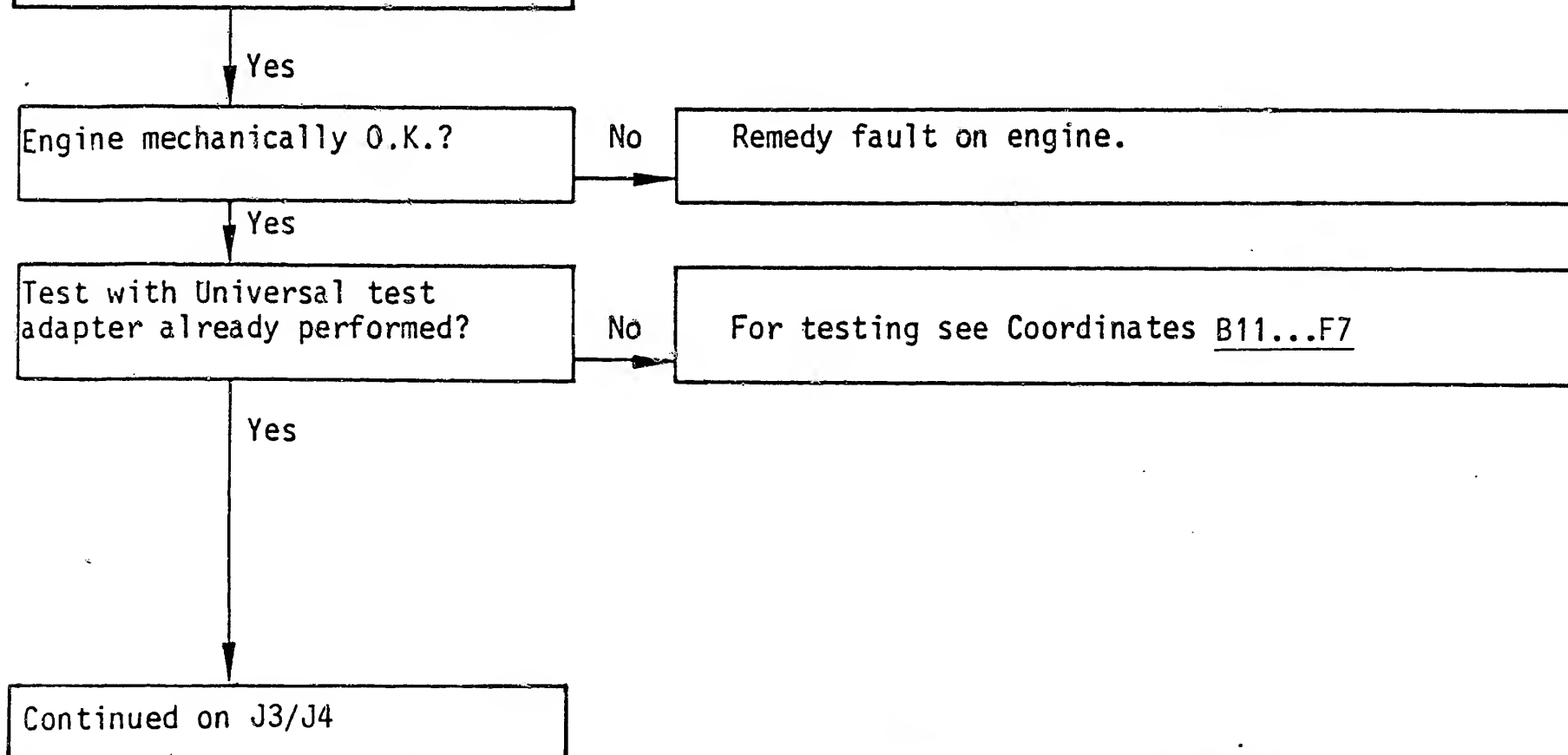
1. The left-hand row contains the questions on the tests.
2. The middle row contains descriptions of the testing and adjustment operations on the components.
3. The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.

START OF TROUBLE-SHOOTING



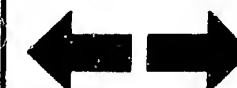
J1

Poor throttle take-up
Alfa Romeo Alfa 90



J2

Poor throttle take-up
Alfa Romeo Alfa 90



Poor throttle take-up (continued)

Yes

Check secondary pattern of all cylinders at cranking speed. Secondary pattern O.K.?

No

Yes

Continued on J5/J6

Check ignition coil and high-voltage part. Check distributor cap for dirt and insulation damage.

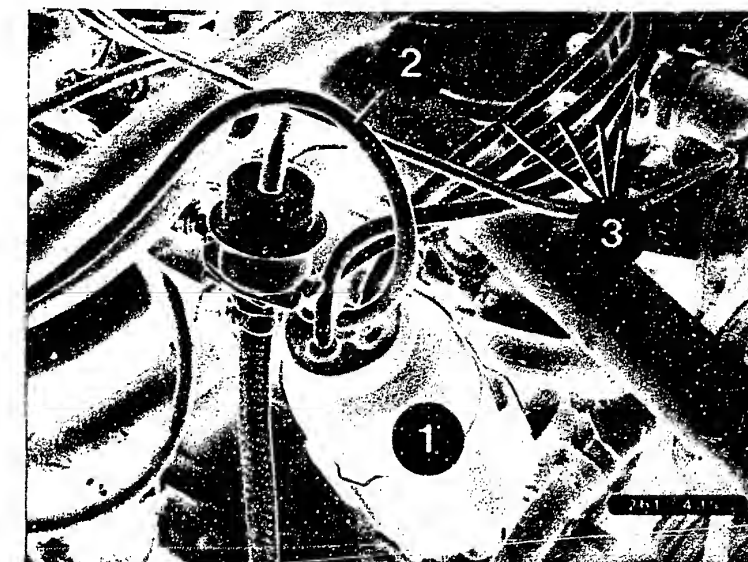
Adjusting the high-voltage distributor:

Remove distributor cap. Set flywheel to TDC (P). Bring housing notch of high-voltage distributor into alignment with center of distributor rotor.

When connecting the H.T. ignition cables, note the cylinder numbers. Do not forget screening cover. Check ignition coil primary for continuity (approx 0 Ω). Secondary resistance: 5 to 7.2 k Ω . Test interference-suppression resistors, ignition cables and spark plugs.

Interference-suppression resistor in

Distributor rotor:	1 k Ω
Distributor outer dome:	1 k Ω
Distributor center dome:	1 k Ω
Spark-plug connector:	5 k Ω
Ignition coil:	0 k Ω



- 1 = High-voltage distributor
- 2 = High-voltage cable to ignition coil
- 3 = Ignition leads

J3

Poor throttle take-up
Alfa Romeo Alfa 90



J4

Poor throttle take-up
Alfa Romeo Alfa 90



Poor throttle take-up (continued)

Yes

Air-flow sensor mechanically
O.K.?

No

Testing: Open air-flow sensor flap by hand. It must be possible to open the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. When the air-flow sensor flap is opened it must not catch at any point. Watch for any indications of abrasion or rubbing. Clean air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are any signs of abrasion or rubbing, replace the air-flow sensor.

Yes

Are all hose lines and electric
leads securely attached?
Visual examination
Is the air-intake system leak-
tight?

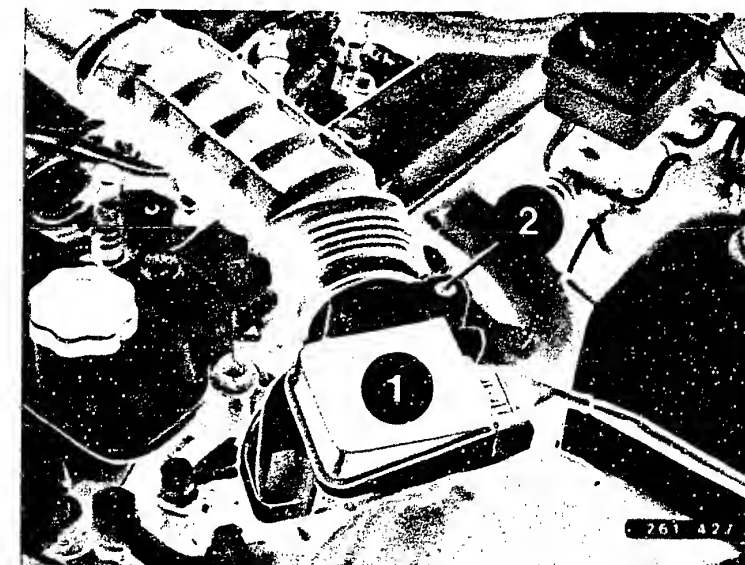
No

Check whether hoses of air-intake system and of fuel line system are securely attached, not kinked or damaged. If necessary, replace hoses. Eliminate leaks with new seals or by re-tightening the connecting screws.

Leak test: Seal off exhaust tail pipe. Open air filter and seal off air-flow sensor duct. Pull off hose after auxiliary-air device and blow air (approx. 0.3 bar gauge pressure) into the intake manifold with a compressed-air gun. Seal off connection port on auxiliary-air device. Open throttle valve fully while doing this. Brush or spray all joints with leak-detector spray or soapy water. Bubbling or foaming indicates a leak. Check electrical plug-in contacts for loose contact. Spring contacts in the connectors must not allow themselves to be pushed back.

Yes

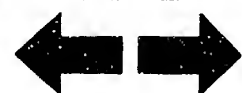
Continued on J7/J8



1 = Air-flow sensor with NTC I
2 = Idle-mixture-adjusting screw

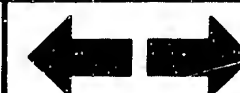
J5

Poor throttle take-up
Alfa Romeo Alfa 90



J6

Poor throttle take-up
Alfa Romeo Alfa 90



Poor throttle take-up (continued)

Yes

Auxiliary-air device tested?

No

Testing (mechanical):

1. Visual examination of auxiliary-air device:
Remove hoses and look down, using a small mirror. When cold, the device must be open; when the engine is warm it must be closed. If not, replace auxiliary-air device.

2. Functional test of auxiliary-air device:
With the engine cold, pinch off hose to auxiliary-air device. Engine speed must drop. With the engine warm, pinch off hose to auxiliary-air device. Engine speed must not drop. If incorrect, replace auxiliary-air device (pay attention to direction of flow).

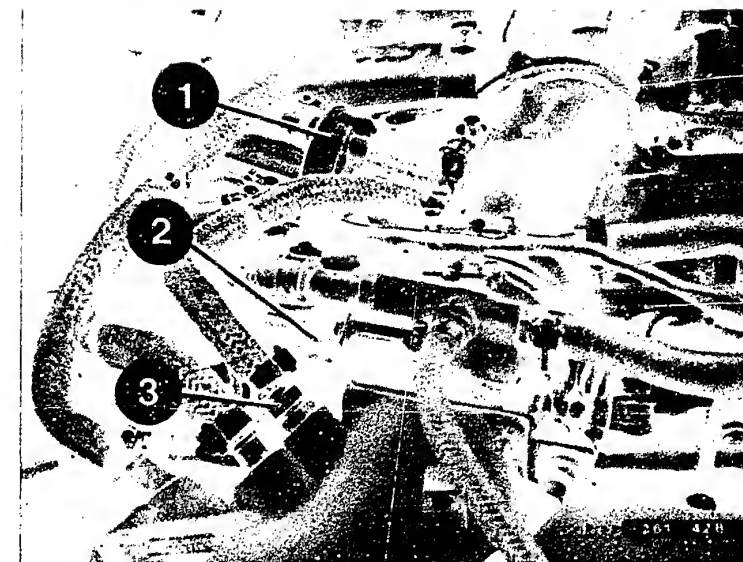
3. Electrical test
Disconnect the plug of the auxiliary-air device. Connect ohmmeter to both terminals of the auxiliary-air device.

Test values: 25 ... 60 Ω

If a value outside the tolerance is shown, replace the auxiliary-air device.

Yes

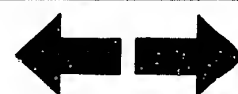
Continued on J9/J10



1 = Auxiliary-air device

J7

Poor throttle take-up
Alfa Romeo Alfa 90



J8

Poor throttle take-up
Alfa Romeo Alfa 90



Poor throttle take-up (continued)

yes

Is camshaft actuation OK?
(Insufficient torque in upper
part- and full-load ranges)

no

1. Check relay 3 (camshaft actuation):
The relay coil including leads has already been tested with the test adapter.
- Switch on ignition and measure voltage at relay 3/term. 30. If there is no measurable voltage, check lead to ignition lock term. 15.
- Replace relay 3.
- Check lead from relay 3/term. 87 to solenoid-operated valve.

2. Check solenoid-operated valve for camshaft actuation:

- Check ground lead from solenoid-operated valve.
- Check solenoid-operated valve winding (approx. 12 Ω).
- Replace solenoid-operated valve.

yes

Testing completed for customer
complaint

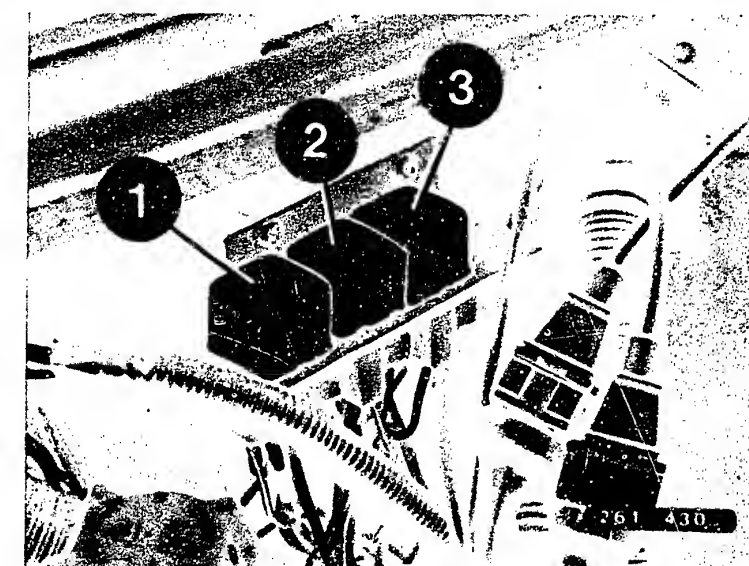
no

"Poor throttle take-up".

Customer complaint remedied?

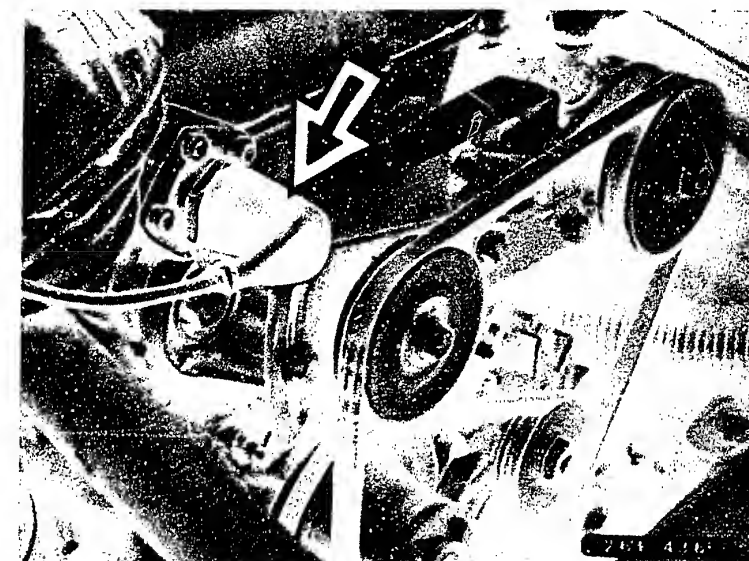
Further possible defects

- Customer complaint incorrectly diagnosed (see Coordinates B3...B10). If the fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (coordinates B3/B4).
- Engine not mechanically OK (compression, valve, setting, timing, worn camshaft).



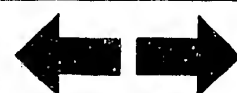
- 1 = Relay 1 (pump relay)
- 2 = Relay 2 (main relay)
- 3 = Relay 3 (camshaft actuation)

Arrow = Solenoid-operated valve for camshaft actuation



J9

Poor throttle take-up
Alfa Romeo Alfa 90



J10

Poor throttle take-up
Alfa Romeo Alfa 90



ENGINE MISSING UNDER ALL OPERATING CONDITIONS

Trouble-shooting program according to customer complaints

How to use the following trouble-shooting program

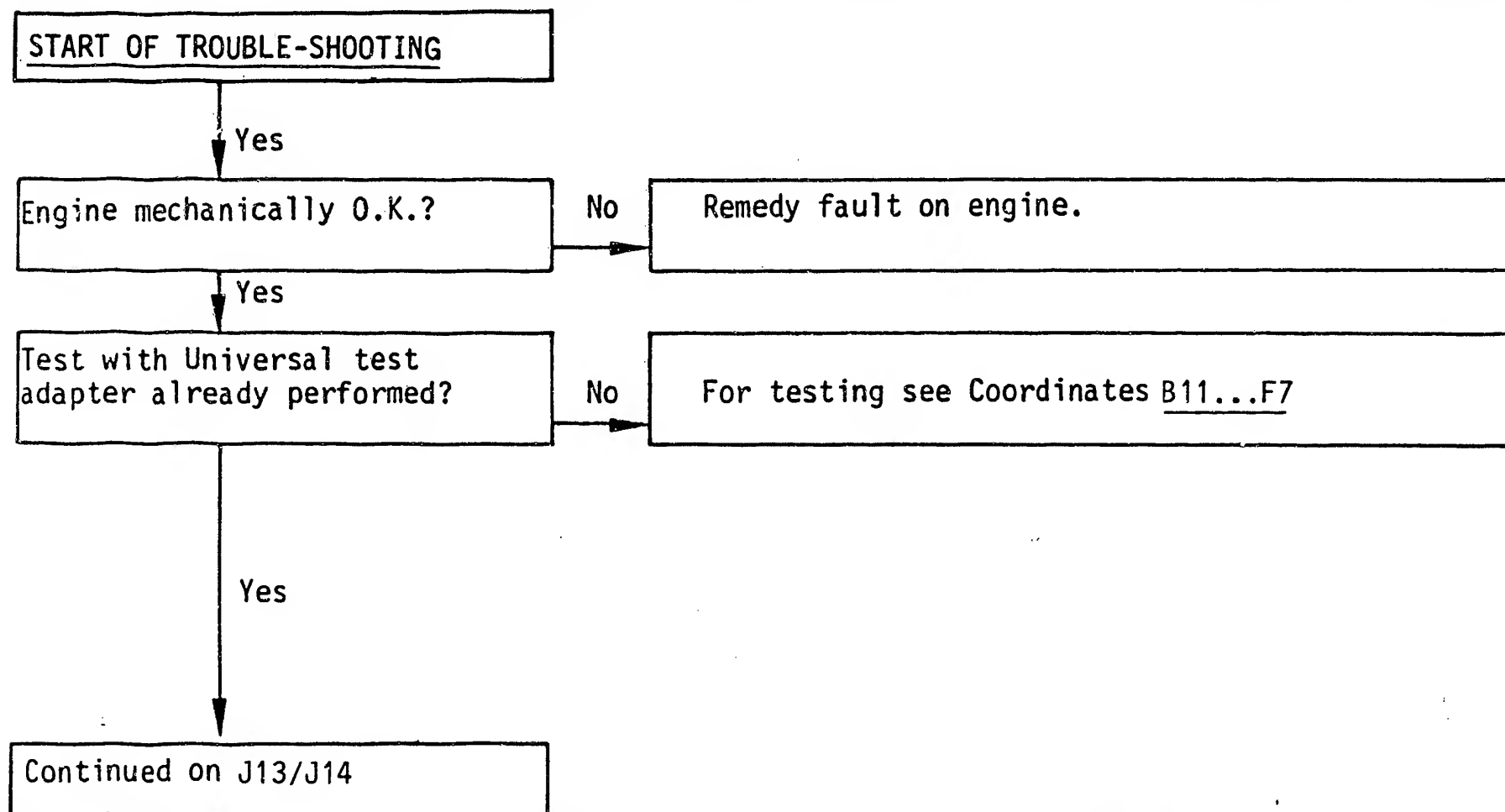
The program is divided into 3 rows of boxes:

1. The left-hand row contains the questions on the tests.
2. The middle row contains descriptions of the testing and adjustment operations on the components.
3. The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.



J11

Engine missing

Alfa Romeo Alfa 90



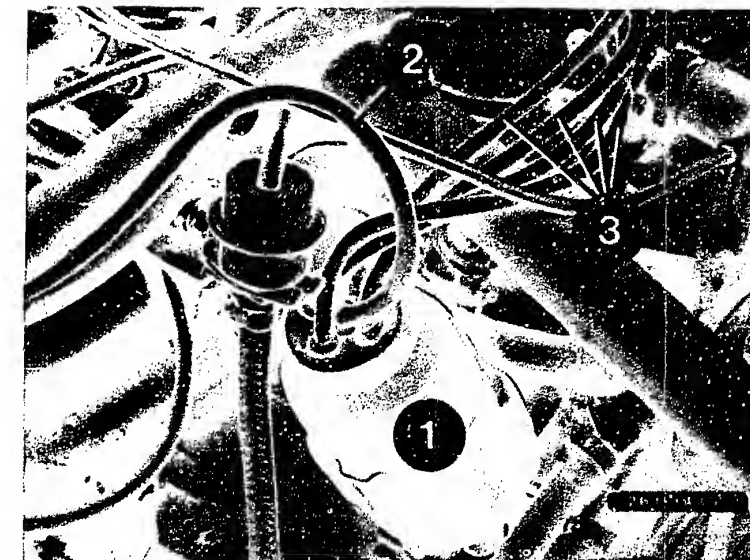
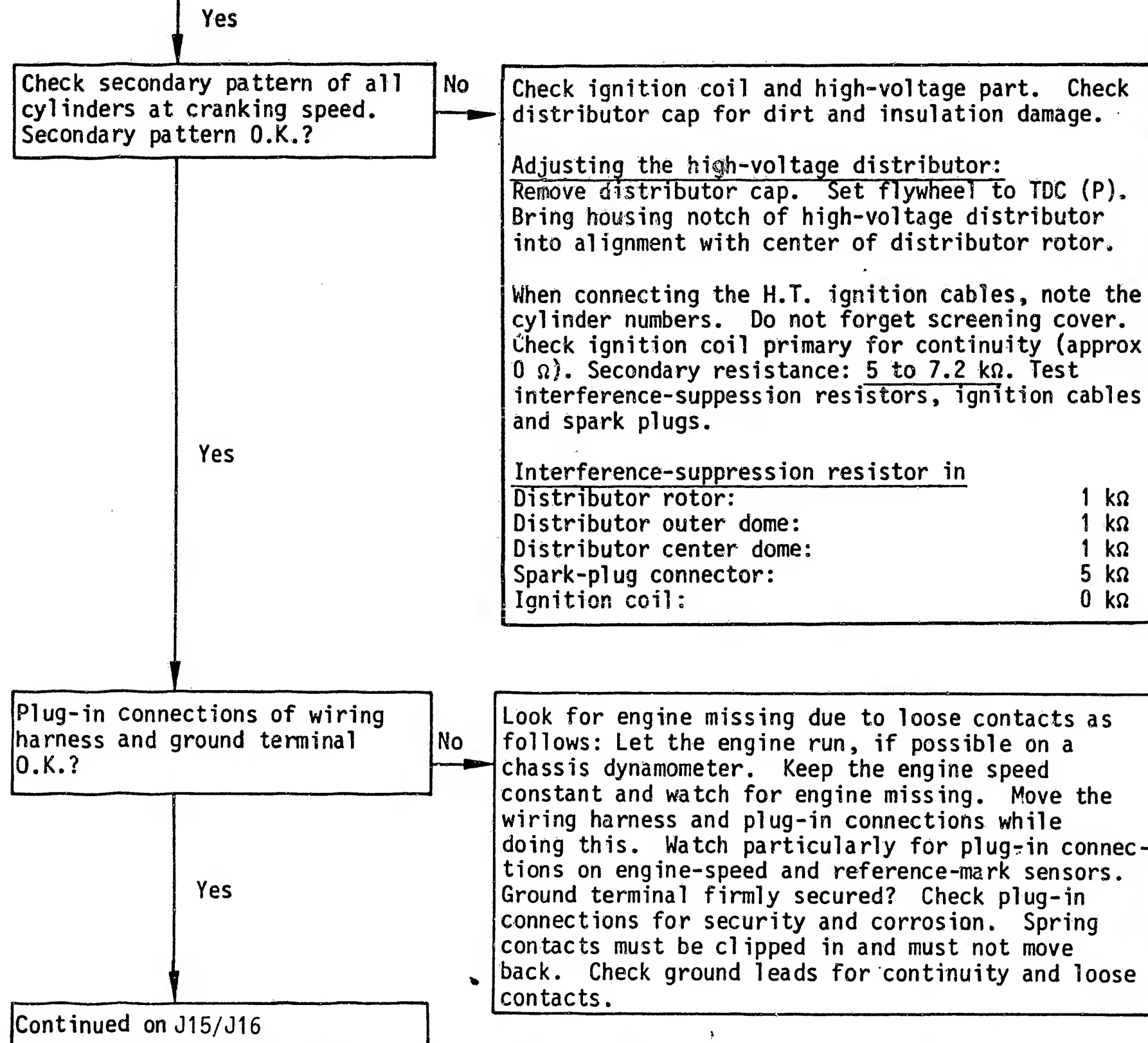
J12

Engine missing

Alfa Romeo Alfa 90

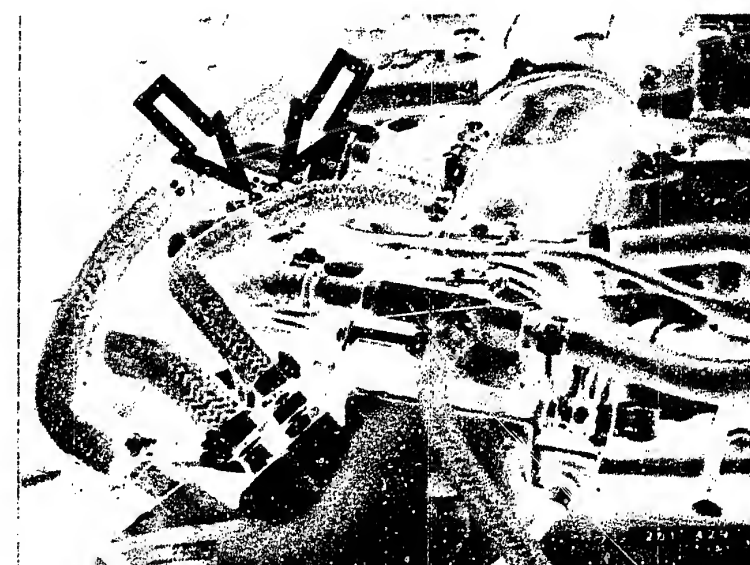


Engine missing under all operating conditions (continued)



- 1 = High-voltage distributor
- 2 = High-voltage cable to ignition coil
- 3 = Ignition leads

Arrows = Ground leads



J13

Engine missing
Alfa Romeo Alfa 90

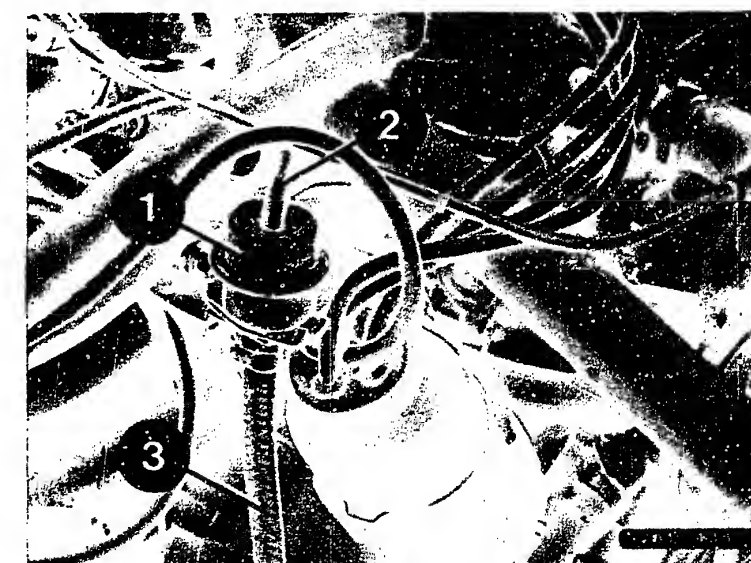
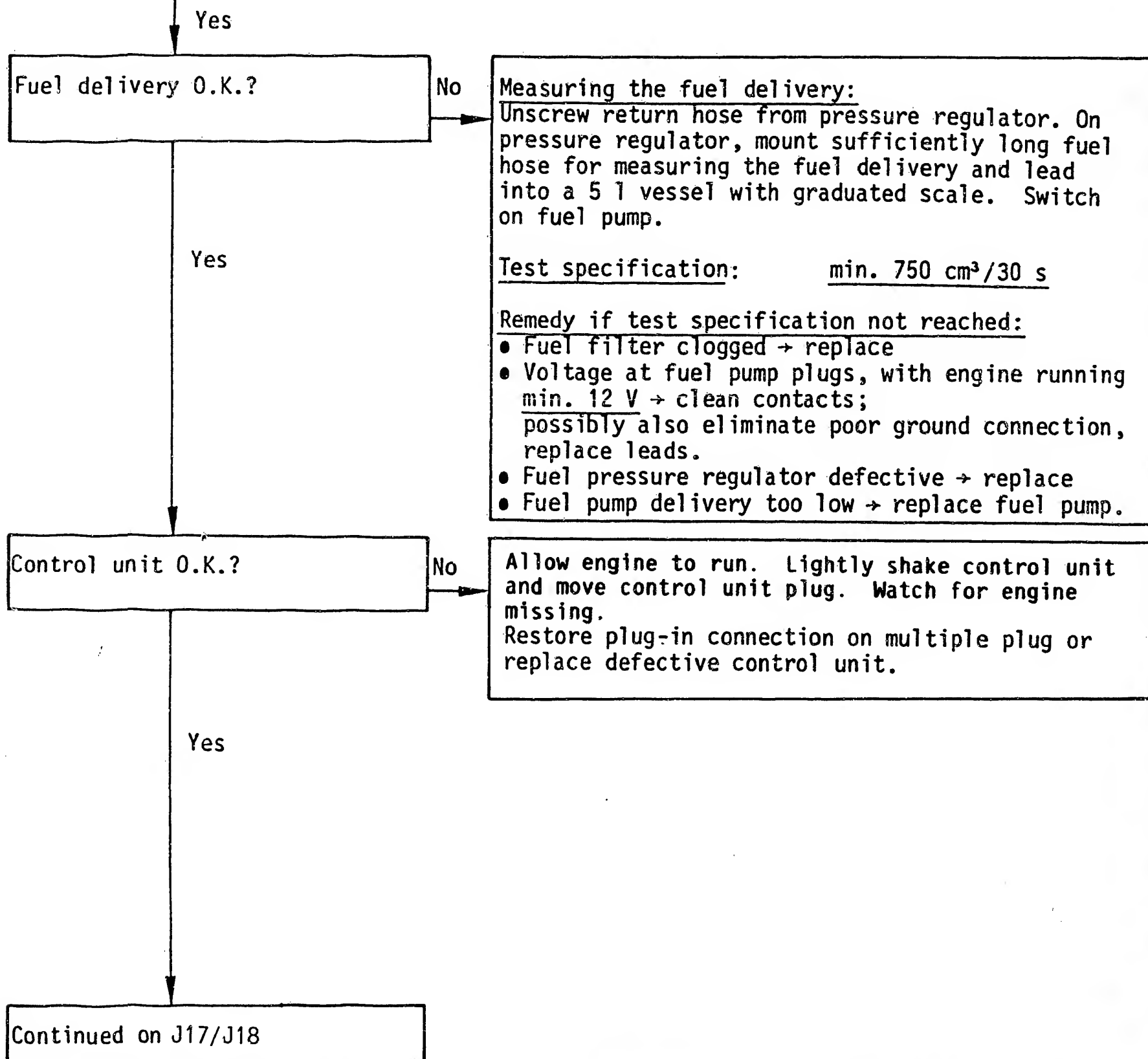


J14

Engine missing
Alfa Romeo Alfa 90

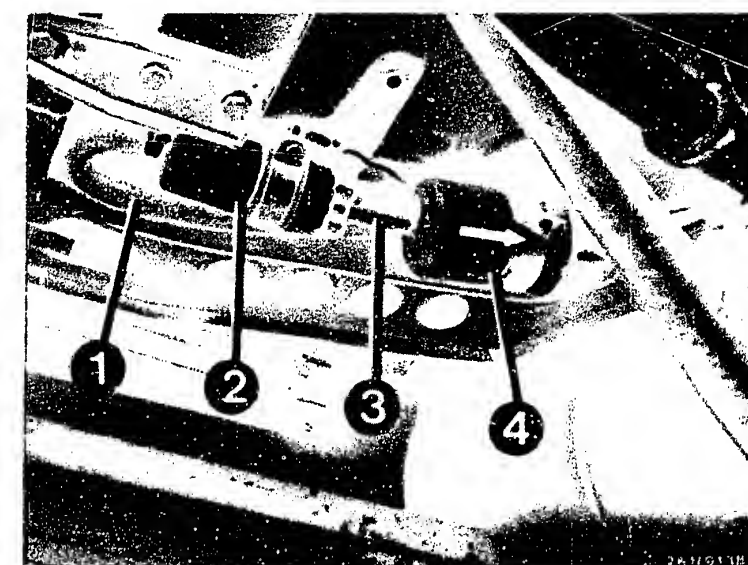


Engine missing under all operating conditions (continued)



1 = Pressure regulator
2 = To intake manifold
3 = Fuel return line

1 = Fuel intake line
2 = Electric fuel pump
3 = Fuel delivery line
4 = Fuel filter
Arrow = Direction of flow



J15

Engine missing
Alfa Romeo Alfa 90



J16

Engine missing
Alfa Romeo Alfa 90



Engine missing under all operating conditions (continued)

Yes

Air-flow sensor O.K.?

No

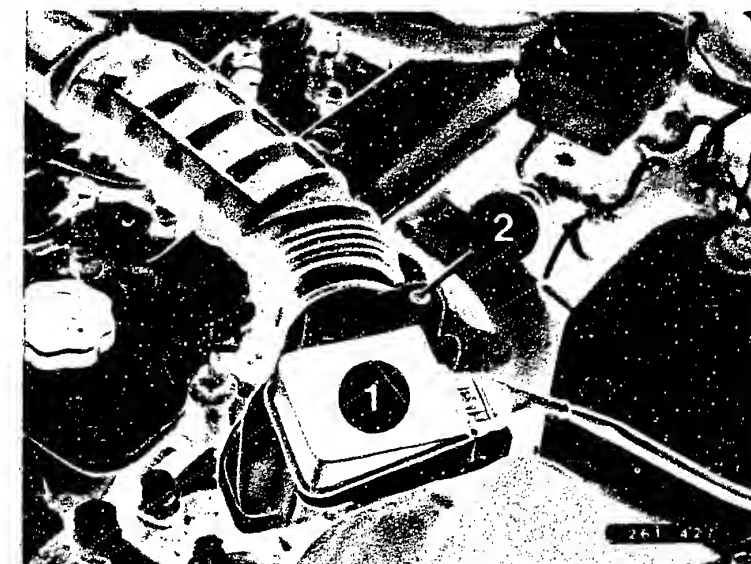
Testing: Open air-flow sensor flap by hand. It must be possible to open the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. When the air-flow sensor flap is opened it must not catch at any point. Watch for any indications of abrasion or rubbing. Clean air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are any signs of abrasion or rubbing, replace the air-flow sensor.

Potentiometer test (noise test)

Remove air-flow sensor. Leave plug on. Set motortester to special input and connect using special cable to air-flow sensor term. 7 (red clip) and term. 6 (black clip). Set control stick for image adjustment on motortester as far as it will go to the left (calibrated setting). Deflect air-flow sensor flap suddenly (several times). If noise signal incorrect (see illustration) replace air-flow sensor. If air-flow sensor O.K., a continuous stroke signal must be visible on the oscilloscope. If air-flow sensor defective, there is a noise signal similar to that in the diagram. Replace air-flow sensor.

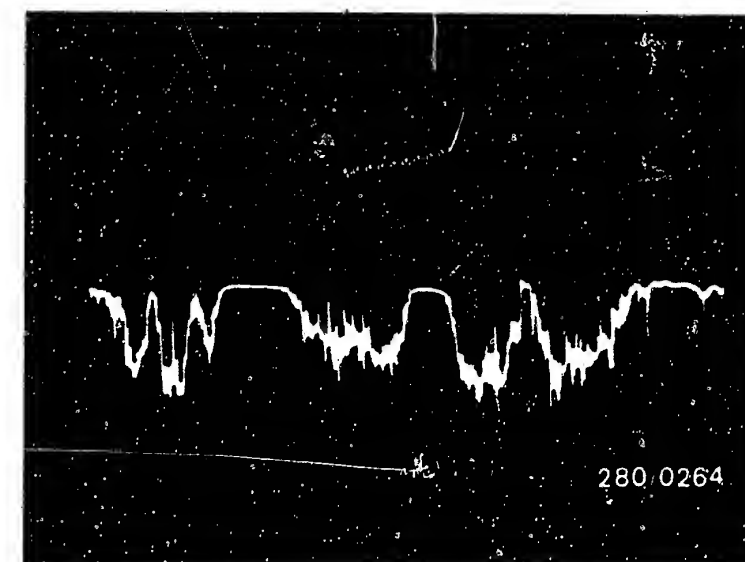
Yes

Continued on J19/J20



1 = Air-flow sensor NTC I
2 = Idle-mixture-adjusting screw

Noise signal if air-flow sensor defective



J17

Engine missing
Alfa Romeo Alfa 90

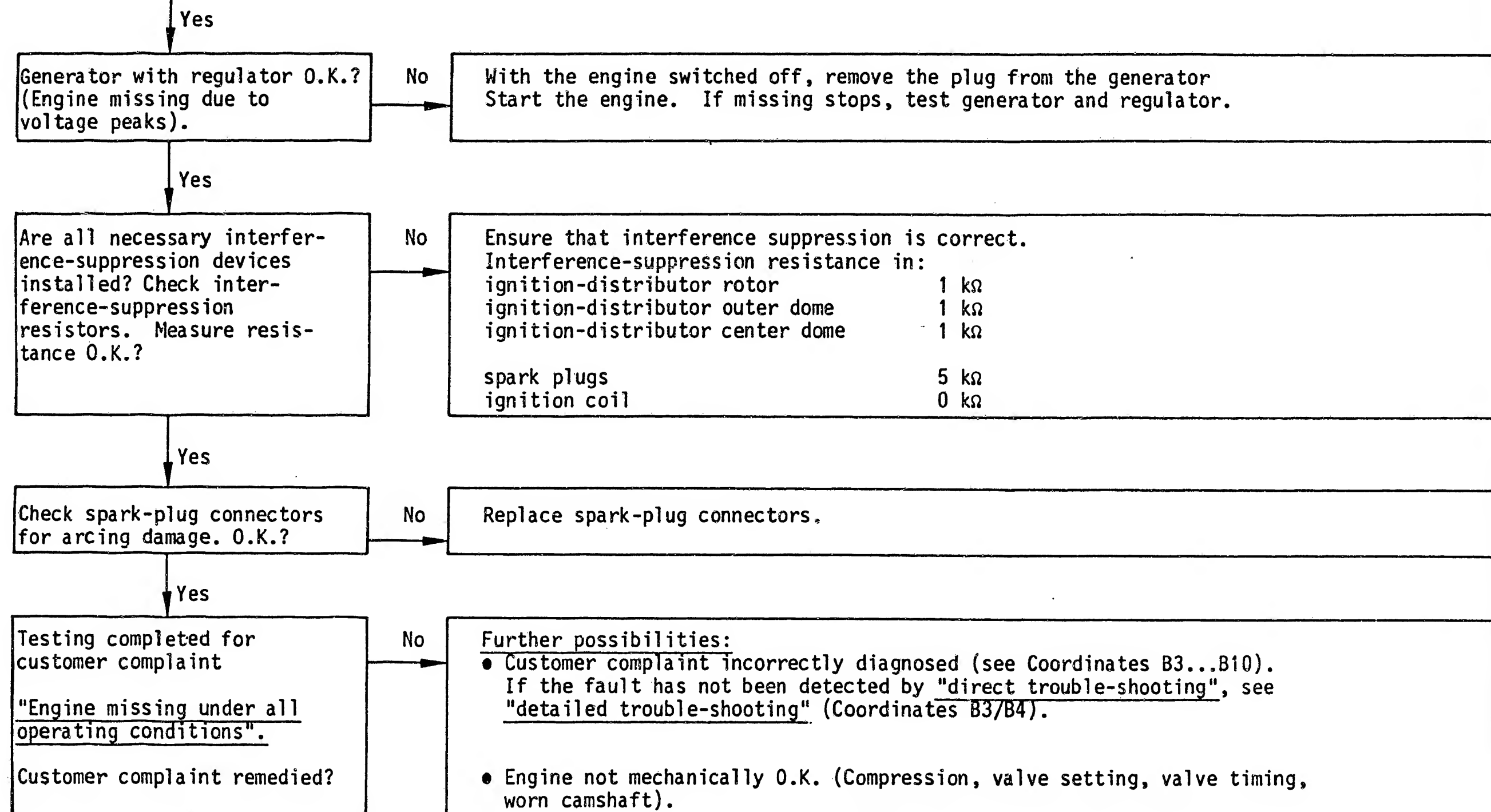


J18

Engine missing
Alfa Romeo Alfa 90



Engine missing under all operating conditions (continued)



FUEL CONSUMPTION TOO HIGH

Trouble-shooting program according to customer complaints

How to use the following trouble-shooting program

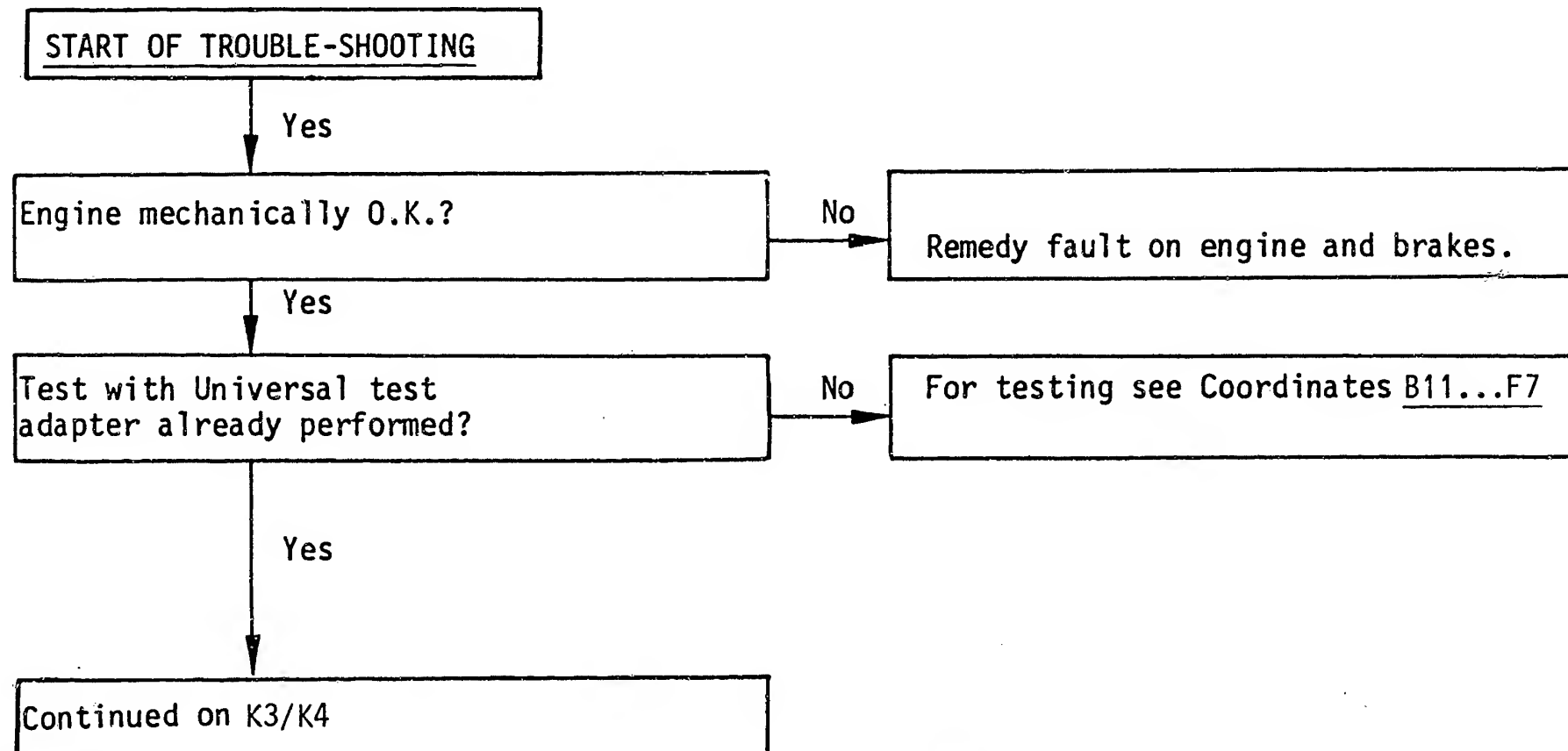
The program is divided into 3 rows of boxes:

1. The left-hand row contains the questions on the tests.
2. The middle row contains descriptions of the testing and adjustment operations on the components.
3. The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.



K1

Fuel consumption too high
Alfa Romeo Alfa 90



K2

Fuel consumption too high
Alfa Romeo Alfa 90



Fuel consumption too high (continued)

Yes

Check secondary pattern of all cylinders at cranking speed. Secondary pattern O.K.?

No

Check ignition coil and high-voltage part. Check distributor cap for dirt and insulation damage.

Adjusting the high-voltage distributor:

Remove distributor cap. Set flywheel to TDC (P). Bring housing notch of high-voltage distributor into alignment with center of distributor rotor.

When connecting the H.T. ignition cables, note the cylinder numbers. Do not forget screening cover. Check ignition coil primary for continuity (approx. 0 Ω). Secondary resistance: 5 to 7.2 k Ω . Test interference-suppression resistors, ignition cables and spark plugs.

Interference-suppression resistor in

Distributor rotor:	1 k Ω
Distributor outer dome:	1 k Ω
Distributor center dome:	1 k Ω
Spark-plug connector:	5 k Ω
Ignition coil:	0 k Ω

Yes

Is camshaft actuation OK?
(Bucking in lower part-load range)

no

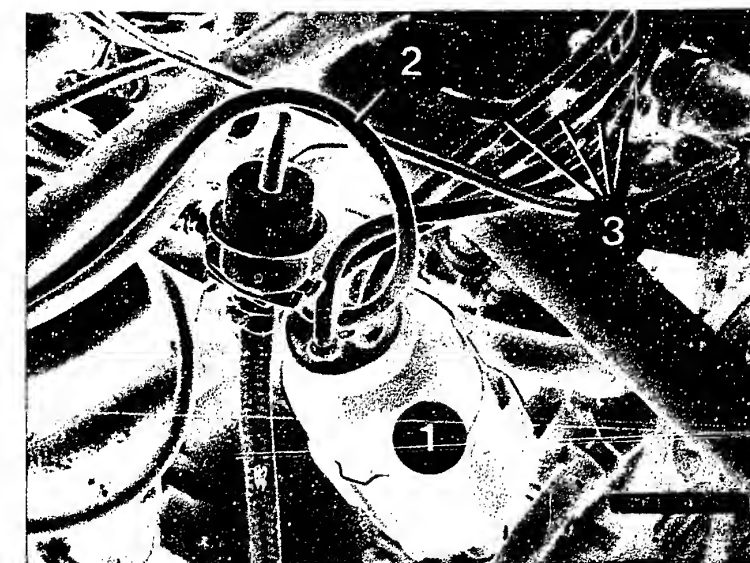
Check relay 3 (camshaft actuation):

- The relay coil including leads has already been tested with the test adapter.
- Switch on ignition and measure voltage at relay 3/term. 87. Nominal value approx. 0 V: i.e. no current flow between term. 30 and term. 87 (see circuit diagram).

yes

Continued on K5/K6

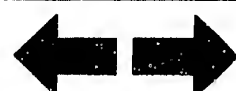
Continued on K5/K6



- 1 = High-voltage distributor
- 2 = High-voltage cable to ignition coil
- 3 = Ignition leads

K3

Fuel consumption too high
Alfa Romeo Alfa 90



K4

Fuel consumption too high
Alfa Romeo Alfa 90



Fuel consumption too high (continued)

yes

Air-flow sensor in good mechanical order?

No

Testing: Open air-flow sensor flap by hand. It must be possible to open the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. When the air-flow sensor flap is opened it must not catch at any point. Watch for any indications of abrasion or rubbing. Clean air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are any signs of abrasion or rubbing, replace the air-flow sensor.

Yes

Testing completed for customer complaint

"Fuel consumption too high".

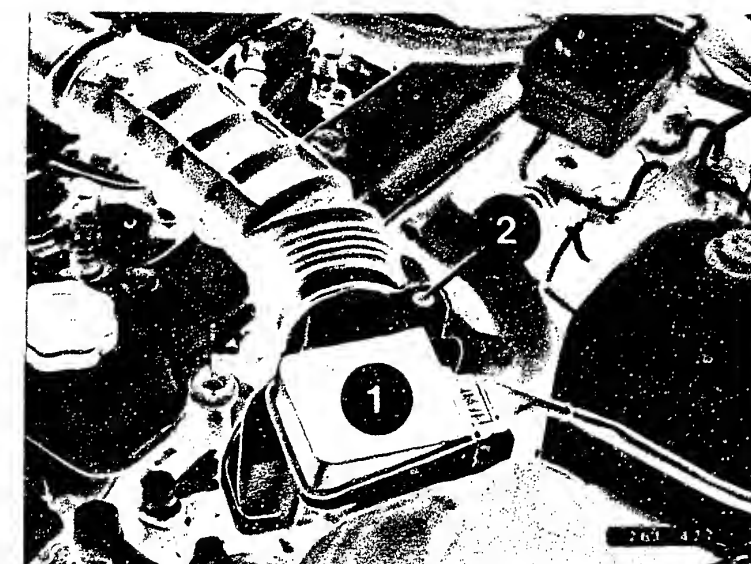
Customer complaint remedied?

No

Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates B3...B10). If the fault has not been detected by "direct trouble-shooting", see "detailed trouble-shooting" (Coordinates B3/B4).
- Engine not mechanically O.K. (Compression, valve setting, valve timing, worn camshaft).

- Wiring harness OK?
Pull off relay 3 and measure voltage again at term. 87 with ignition on:
Nominal value approx. 0 V.
Is lead to solenoid-operated valve connected at relay 3/term. 87? There must be no voltage present at solenoid-operated valve (ignition on).



1 = Air-flow sensor with NTC I
2 = Idle-mixture-adjusting screw

K5

Fuel consumption too high
Alfa Romeo Alfa 90



K6

Fuel consumption too high
Alfa Romeo Alfa 90



NO MAXIMUM ENGINE POWER / TOP SPEED NOT REACHED

Trouble-shooting program according to customer complaints

How to use the following trouble-shooting program

The program is divided into 3 rows of boxes:

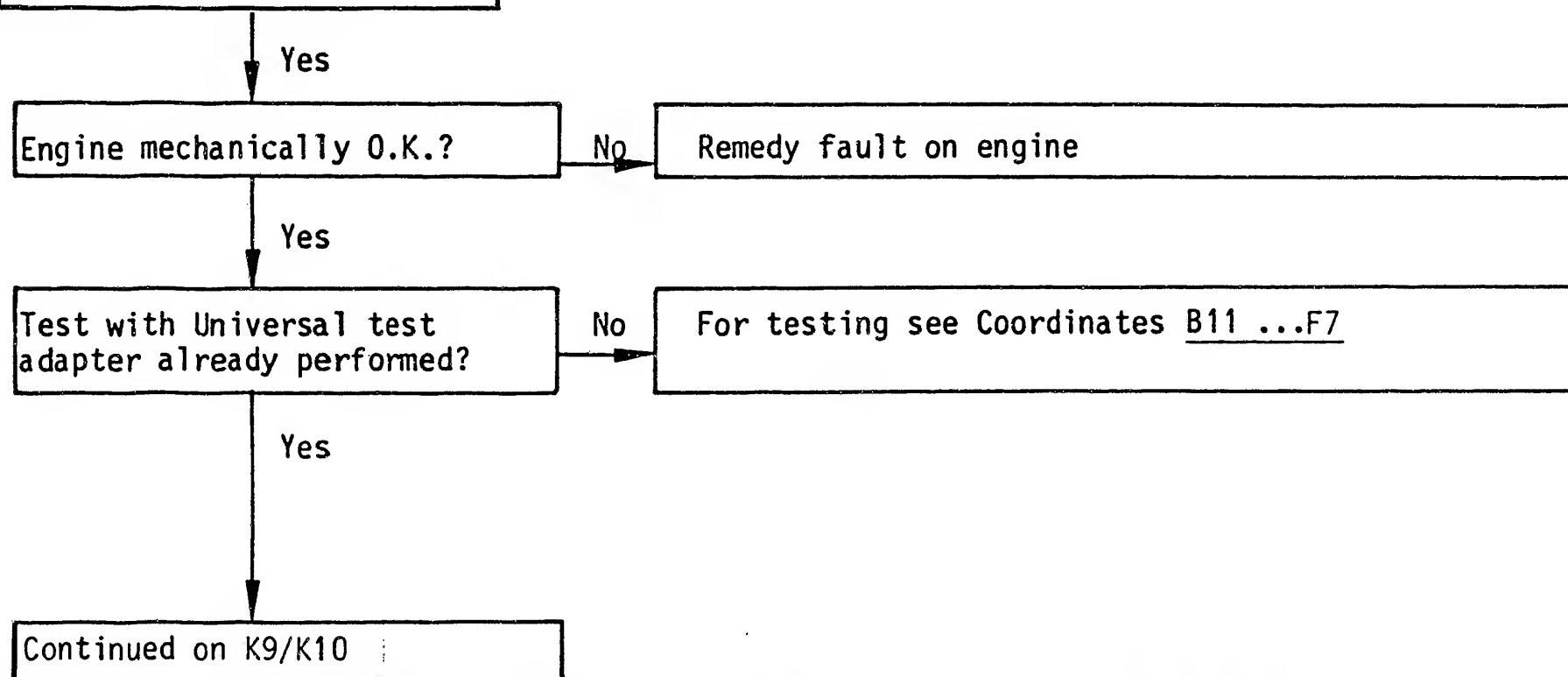
1. The left-hand row contains the questions on the tests.
2. The middle row contains descriptions of the testing and adjustment operations on the components.
3. The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.

START OF TROUBLE-SHOOTING



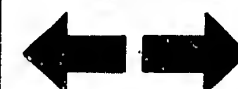
K7

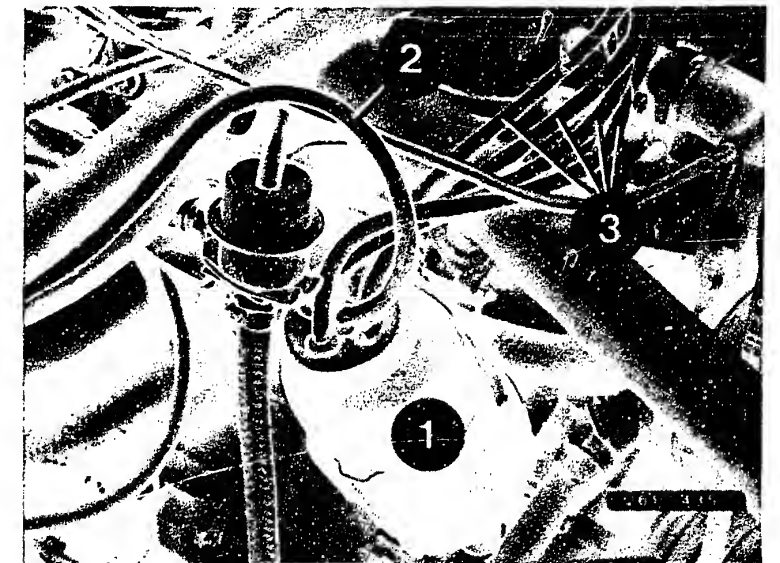
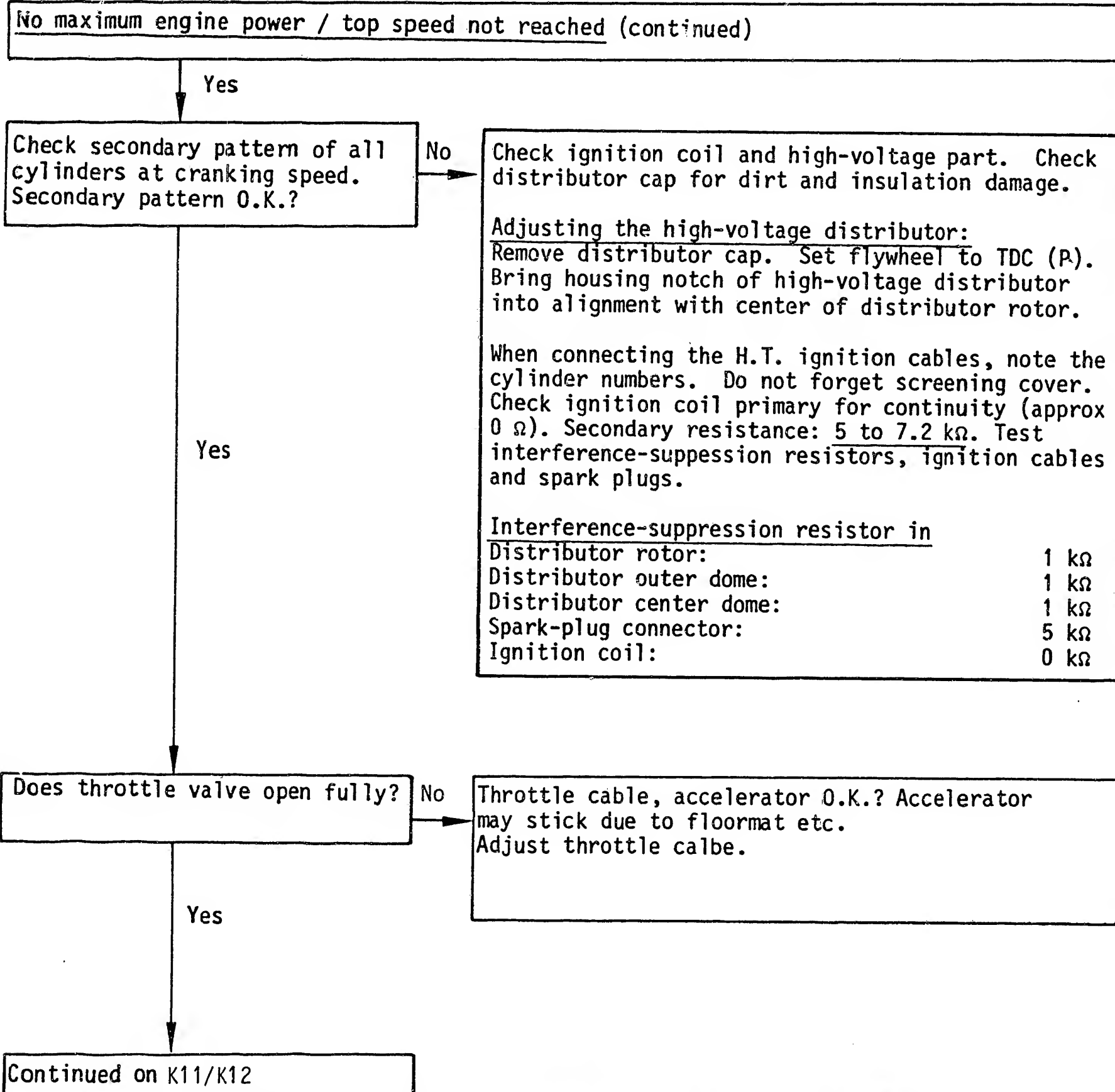
No maximum engine power
Alfa Romeo Alfa 90



K8

No maximum engine power
Alfa Romeo Alfa 90





- 1 = High-voltage distributor
- 2 = High-voltage cable to ignition coil
- 3 = Ignition leads

K9

No maximum engine power
Alfa Romeo Alfa 90



K10

No maximum engine power
Alfa Romeo Alfa 90



No maximum engine power / top speed not reached (continued)

Yes

Fuel pressure at full load O.K.?

No

Test the fuel pressure on a chassis dynamometer at rated speed and rated power:
Install pressure gauge into fuel inlet to fuel distribution pipe.
Note: When opening the cap nut, pay attention to the fitted bearing.
Collect any fuel which runs out. Danger of fire with engine hot and with sparks.

Test specification at full load:

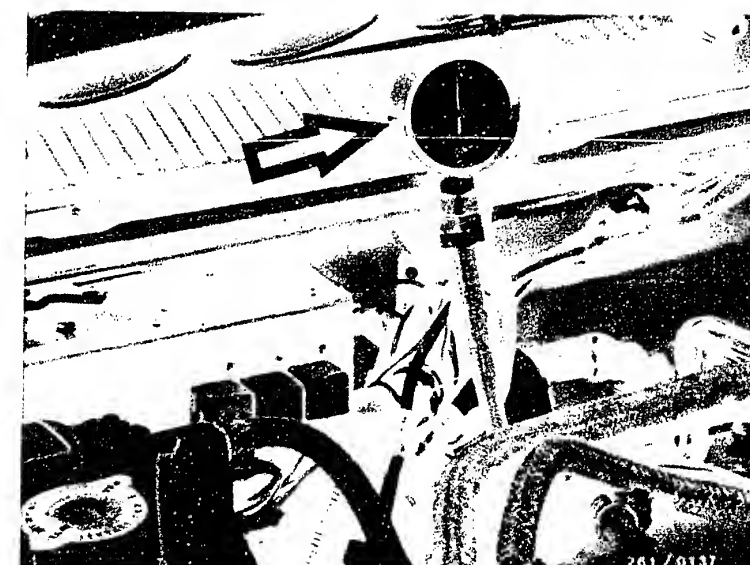
2.8 ... 3.2 bar
(Reading may fluctuate slightly)

Remedy if test specification not reached:

- Fuel filter clogged → replace
- Voltage at fuel pump plugs, with engine running min. 12 V → clean contacts, possibly eliminate poor ground connection, replace leads.
- Fuel pressure regulator defective → replace
- Fuel pump delivery too low → replace fuel pump.
- Strainer in tank clogged? Corrosion in tank?

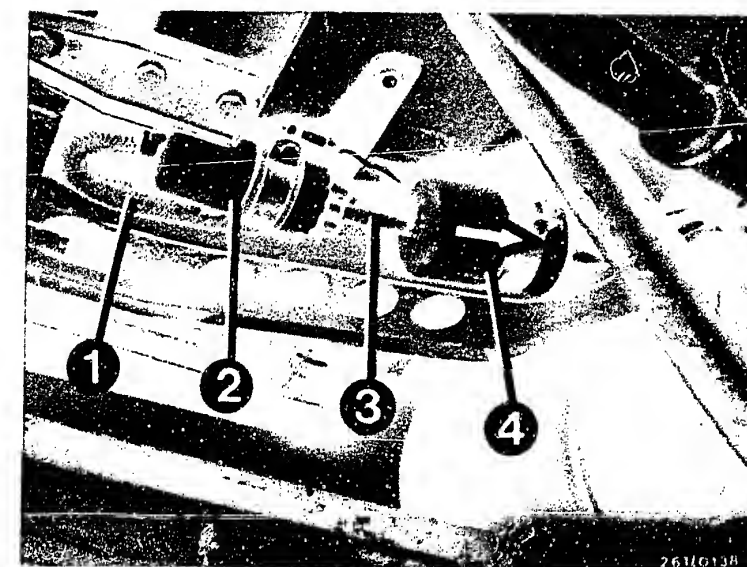
Yes

Continued on K13/K14



Arrow = Pressure gauge

1 = Fuel intake line
2 = Electric fuel pump
3 = Fuel delivery line
4 = Fuel filter
Arrow = Direction of fuel flow



K11

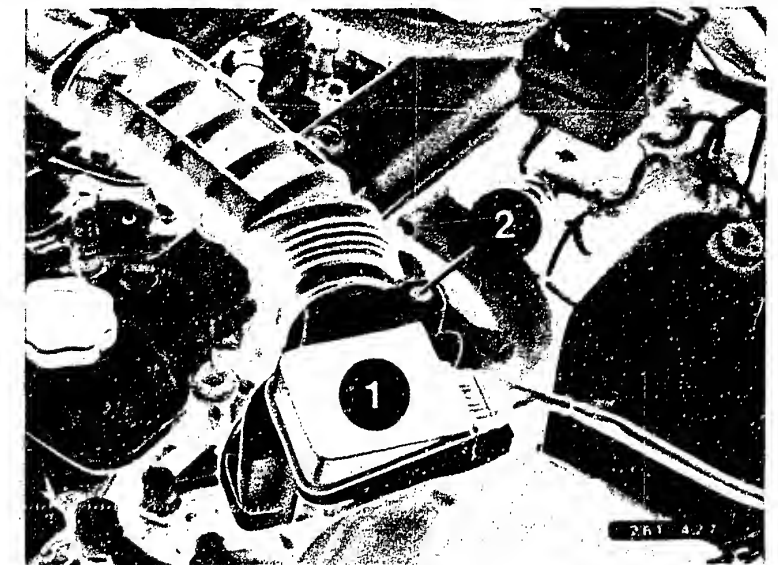
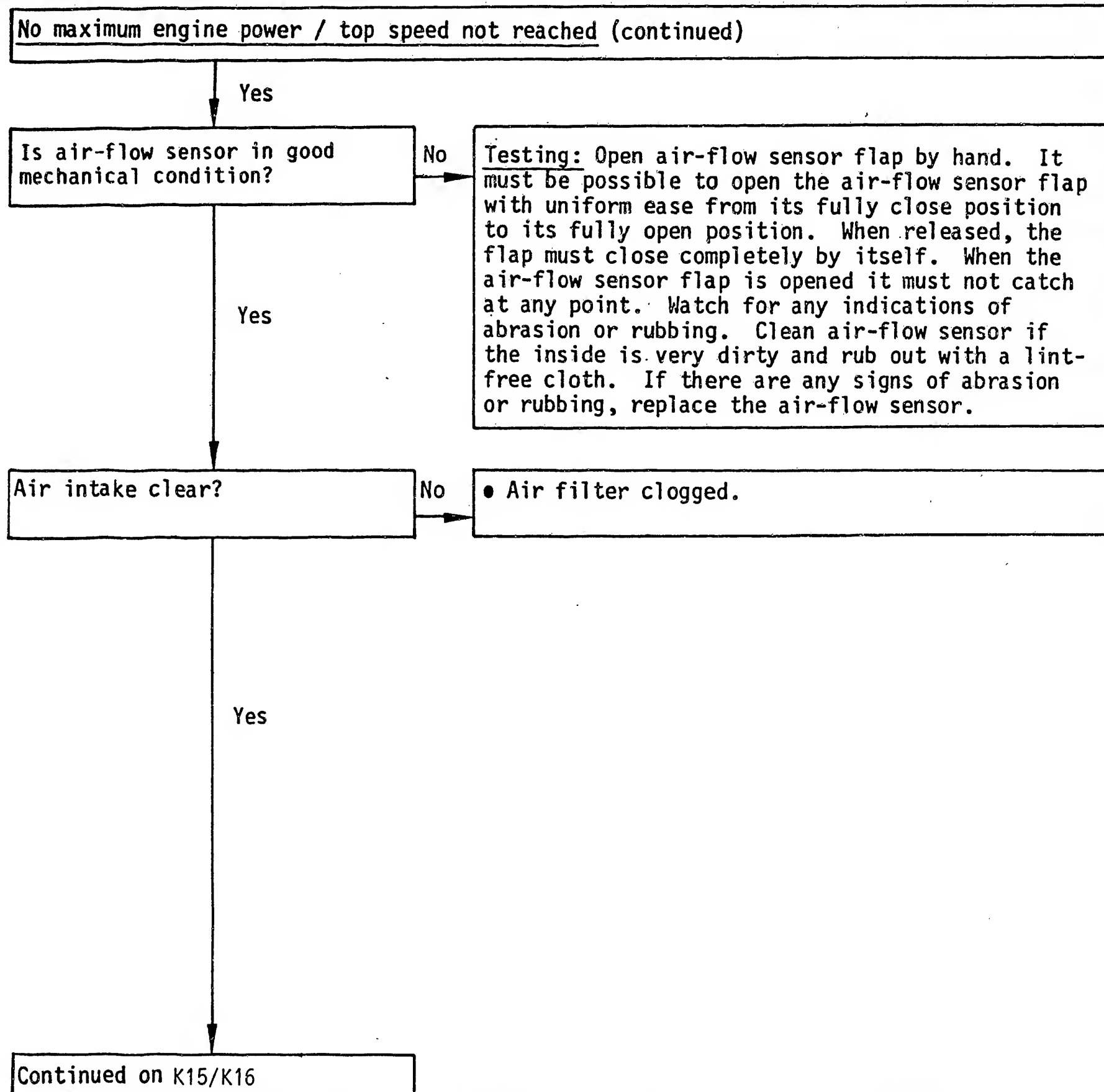
No maximum engine power
Alfa Romeo Alfa 90



K12

No maximum engine power
Alfa Romeo Alfa 90





1 = Air-flow sensor with NTC I
2 = Idle-mixture-adjusting screw

K13

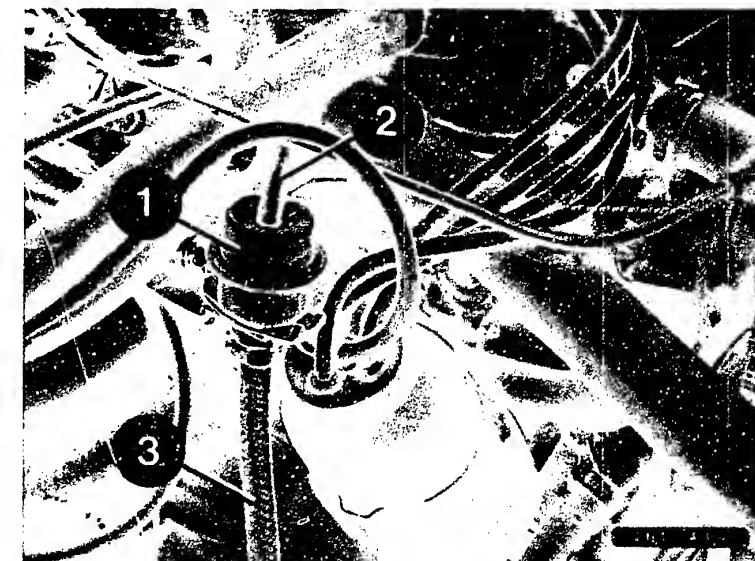
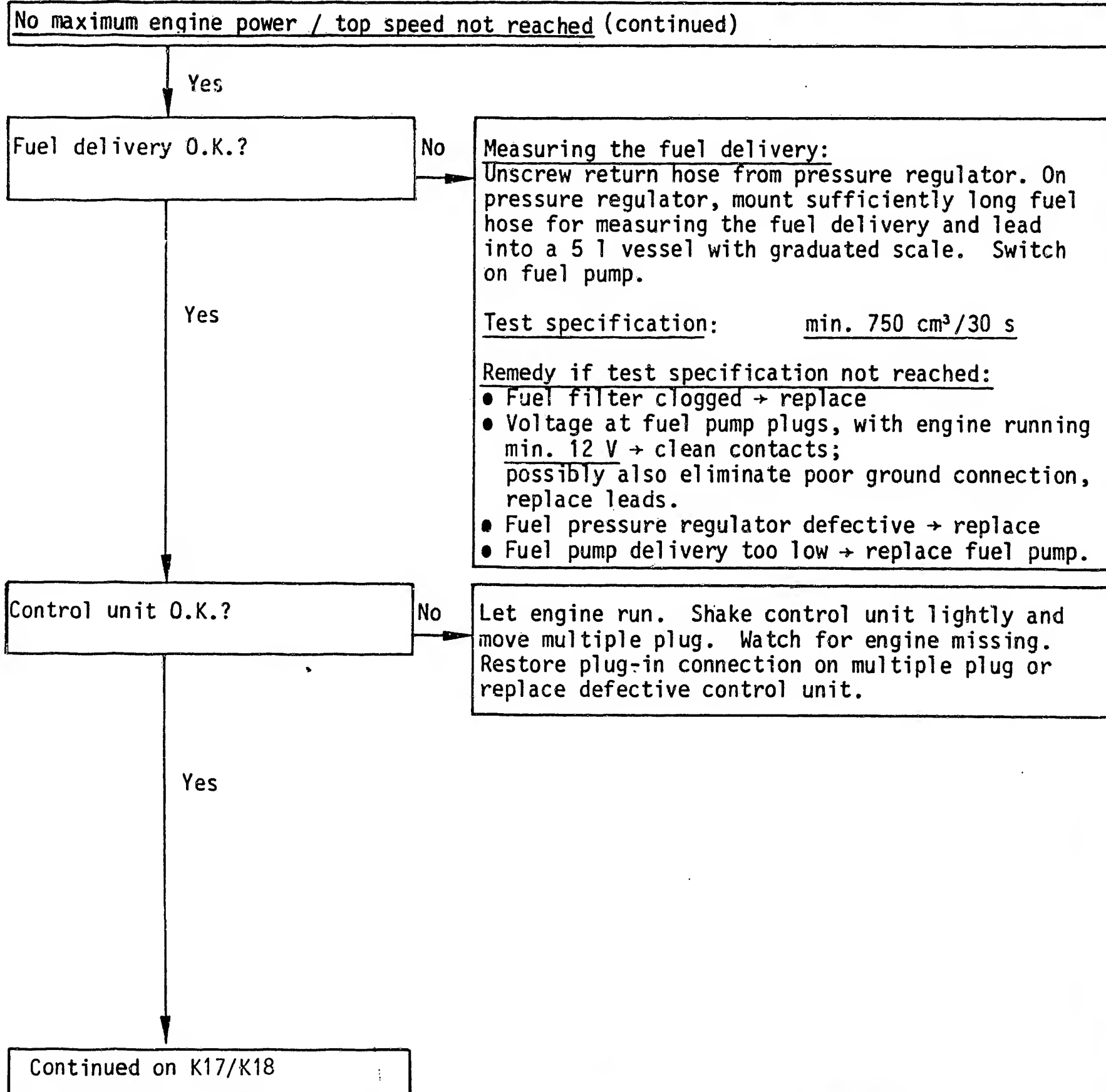
No maximum engine power
Alfa Romeo Alfa 90



K14

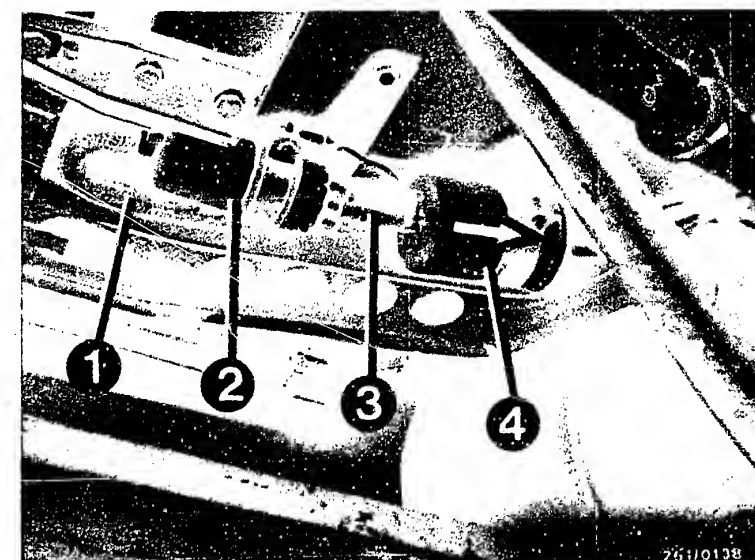
No maximum engine power
Alfa Romeo Alfa 90





1 = Pressure regulator
 2 = To intake manifold
 3 = Fuel return line

1 = Fuel intake line
 2 = Electric fuel pump
 3 = Fuel delivery line
 4 = Fuel filter
 Arrow = Direction of flow



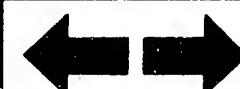
K15

No maximum engine power
 Alfa Romeo Alfa 90



K16

No maximum engine power
 Alfa Romeo Alfa 90



No maximum engine power / top speed not reached (continued)

Yes

Are all hose lines and electric leads securely attached?
Visual examination.
Is the air-intake system leak-tight?

No

Check whether hoses of air-intake system and of fuel line system are securely attached, not kinked or damaged. If necessary, replace hoses. Eliminate leaks with new seals or by re-tightening the connecting screws.
Leak test: Seal off exhaust tail pipe. Open air filter and seal off air-flow sensor duct. Pull off hose after auxiliary-air device and blow air (approx. 0.3 bar gauge pressure) into the intake manifold with a compressed-air gun. Seal off connection port on auxiliary-air device. Open throttle valve fully while doing this. Brush or spray all joints with leak-detector spray or soapy water. Bubbling or foaming indicates a leak. Check electrical plug-in contacts for loose contact. Spring contacts in the connectors must not allow themselves to be pushed back.

Yes

Camshaft energization OK?
(Insufficient torque in upper part- and full-load ranges).

No

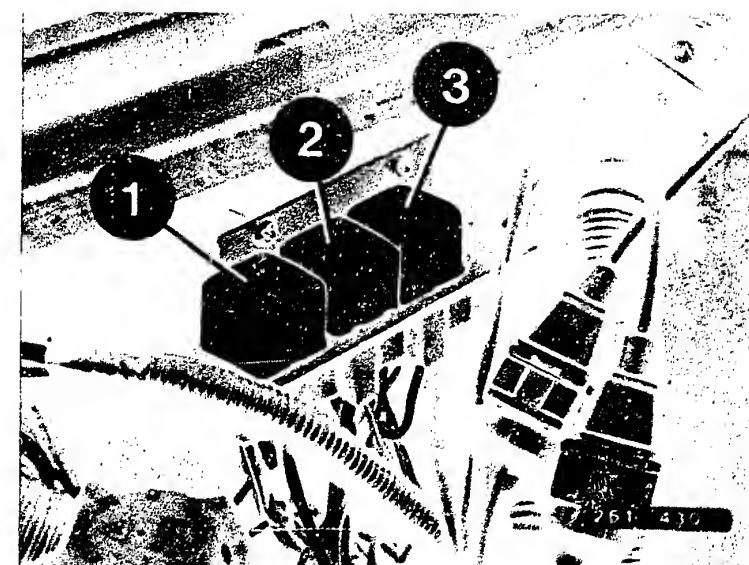
1. Check relay (camshaft energization):

- The relay coil including leads was already tested with the test adapter.
- Switch on ignition and measure voltage at relay 3 term. 30. If no voltage measurable, check lead to ignition lock term. 15.

Yes

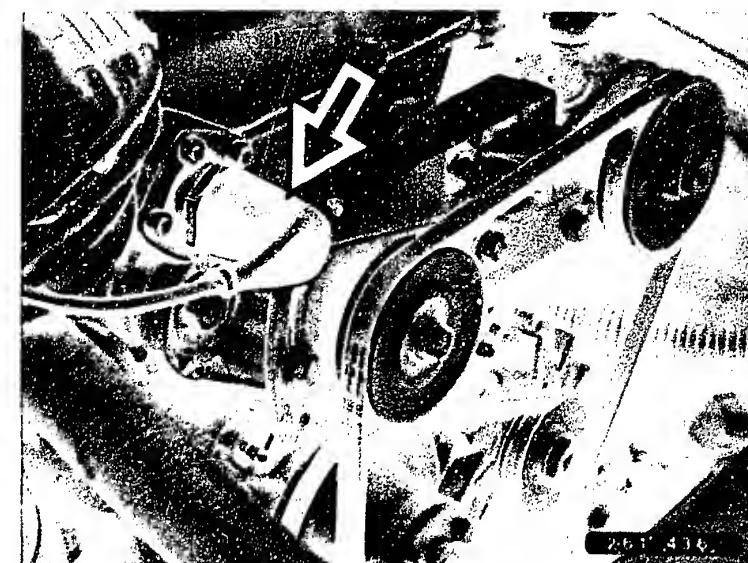
Continued on K19/K20

Continued on K19/K20



- 1 = Relay 1 (pump relay)
2 = Relay 2 (main relay)
3 = Relay 3 (camshaft energization)

Arrow = Solenoid-operated valve for camshaft actuation



K17

No maximum engine power
Alfa Romeo Alfa 90



K18

No maximum engine power
Alfa Romeo Alfa 90



Maximum engine power/top speed not reached (continued)

yes

- Replace relay 3
- Test lead from relay 3 term. 87 to solenoid-operated valve
- 2. Test solenoid-operated valve for camshaft energization:
 - Test ground lead of solenoid-operated valve.
 - Test solenoid-operated valve winding (approx. 12 Ω).
- Replace solenoid-operated valve.

Testing completed for customer complaint

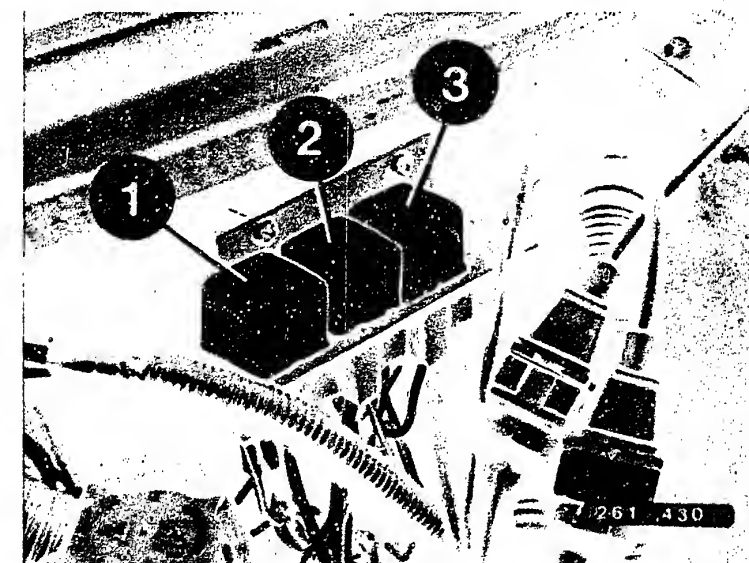
"No maximum engine power".

Customer complaint remedied?

no

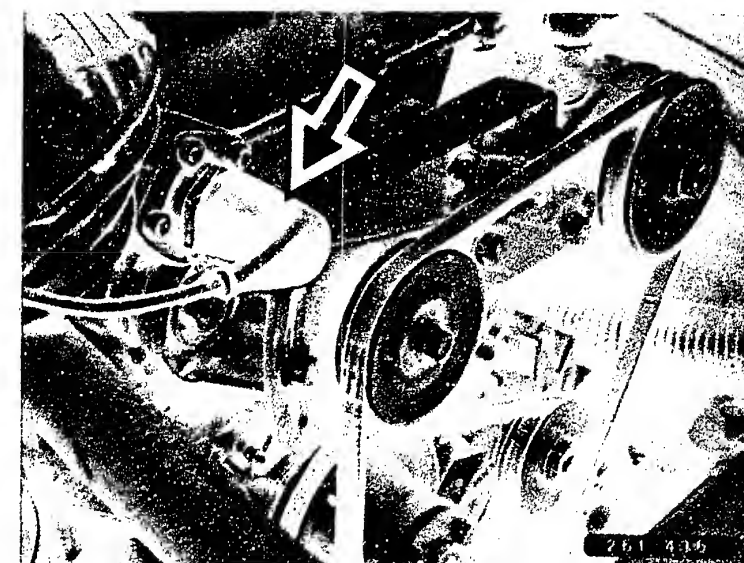
Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates B 3...B 10). If the fault has not been detected with "direct trouble-shooting", see "detailed trouble-shooting" (Coordinates B 3/B 4).
- Engine not mechanically O.K. (compression, valve setting, valve timing, worn camshaft).



1 = Relay 1 (pump relay)
2 = Relay 2 (main relay)
3 = Relay 3 (camshaft energization)

Arrow = Solenoid-operated valve for camshaft actuation



K19

No maximum engine power
Alfa Romeo Alfa 90



K20

No maximum engine power
Alfa Romeo Alfa 90



CO ADJUSTMENT AT IDLE TOO LOW OR TOO HIGH

Trouble-shooting program according to customer complaints

How to use the following trouble-shooting program

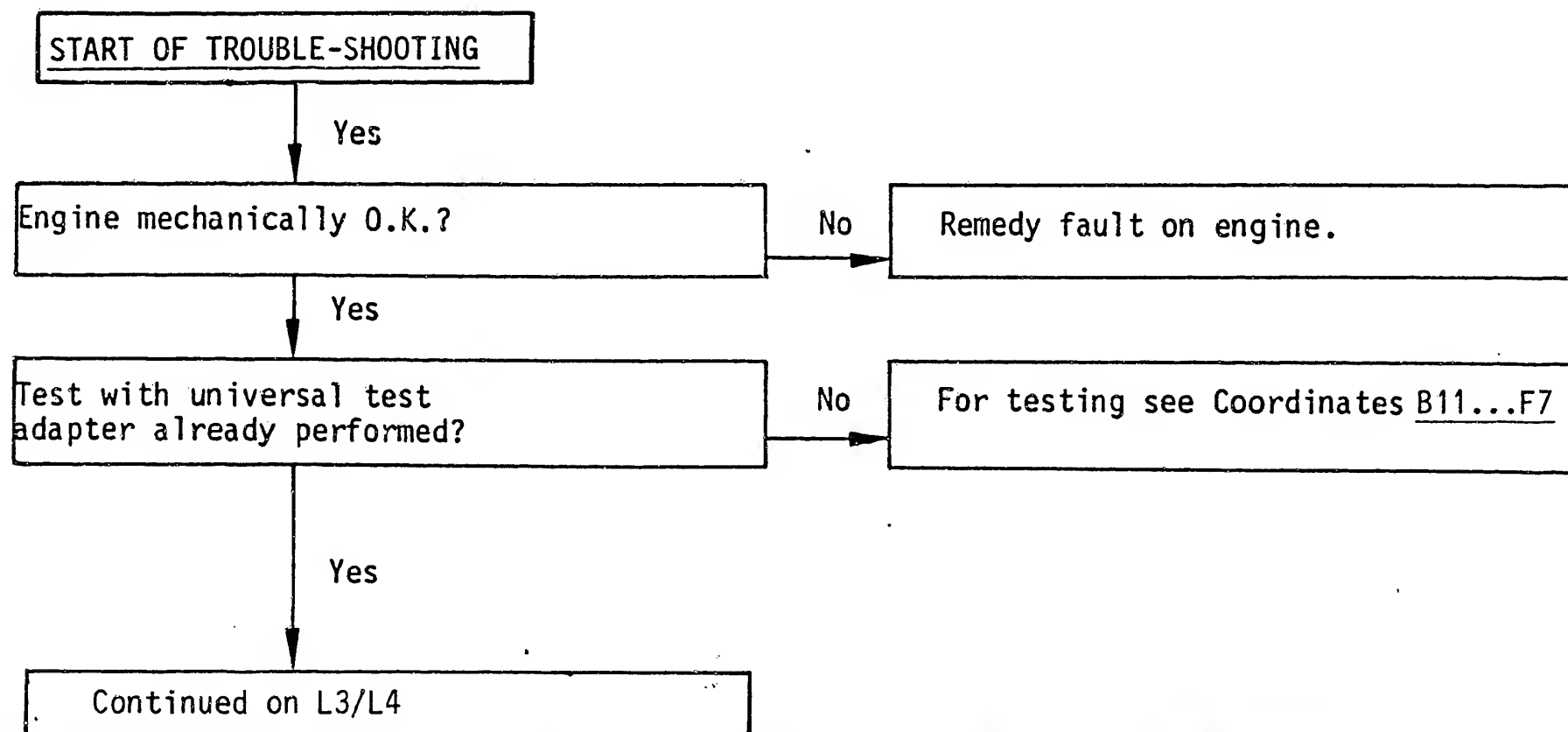
The program is divided into 3 rows of boxes:

1. The left-hand row contains the questions on the tests.
2. The middle row contains descriptions of the testing and adjustment operations on the components.
3. The right-hand row contains the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question below.

If, on the other hand, the answer to the question is "no", and you suspect a fault, branch to the middle row of boxes and carry out the tests given there.

When you have finished testing continue trouble-shooting at the point at which you branched off.



L1

CO adjustment

Alfa Romeo Alfa 90



L2

CO adjustment

Alfa Romeo Alfa 90



CO adjustment at idle too low or too high (continued)

Yes

Check secondary pattern of all cylinders at cranking speed. Secondary pattern O.K.?

No

Check ignition coil and high-voltage part. Check distributor cap for dirt and insulation damage.

Adjusting the high-voltage distributor:
Remove distributor cap. Set flywheel to TDC (P). Bring housing notch of high-voltage distributor into alignment with center of distributor rotor.

When connecting the H.T. ignition cables, note the cylinder numbers. Do not forget screening cover. Check ignition coil primary for continuity (approx 0 Ω). Secondary resistance: 5 to 7.2 k Ω . Test interference-suppression resistors, ignition cables and spark plugs.

Interference-suppression resistor in

Distributor rotor:	1 k Ω
Distributor outer dome:	1 k Ω
Distributor center dome:	1 k Ω
Spark-plug connector:	5 k Ω
Ignition coil:	0 k Ω

Yes

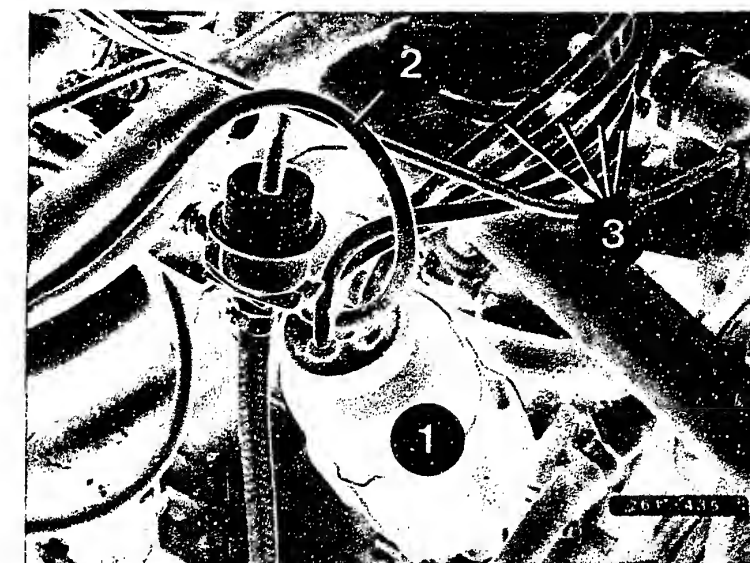
Is air-flow sensor in good mechanical condition?

No

Testing: Open air-flow sensor flap by hand. It must be possible to open the air-flow sensor flap with uniform ease from its fully closed position to its fully open position. When released, the flap must close completely by itself. When the air-flow sensor flap is opened it must not catch at any point. Watch for any indications of abrasion or rubbing. Clean air-flow sensor if the inside is very dirty and rub out with a lint-free cloth. If there are any signs of abrasion or rubbing, replace the air-flow sensor.

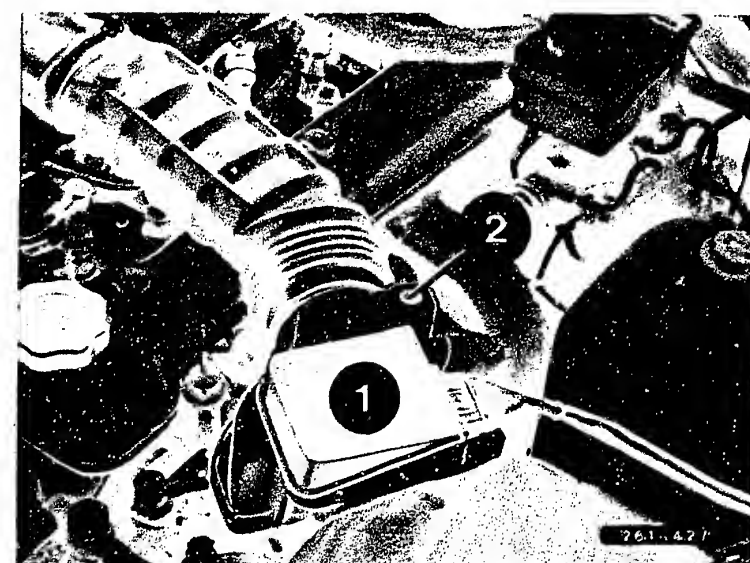
Yes

Continued on L5/L6



- 1 = High-voltage distributor
- 2 = High-voltage cable to ignition coil
- 3 = Ignition leads

- 1 = Air-flow sensor with NTC I
- 2 = Idle-mixture-adjusting screw



L3

CO adjustment

Alfa Romeo Alfa 90



L4

CO adjustment

Alfa Romeo Alfa 90



CO adjustment at idle too low or too high (continued)

yes

Is camshaft actuation OK?
(Bucking in lower part-load
range).

no

Check relay 3 (camshaft actuation):

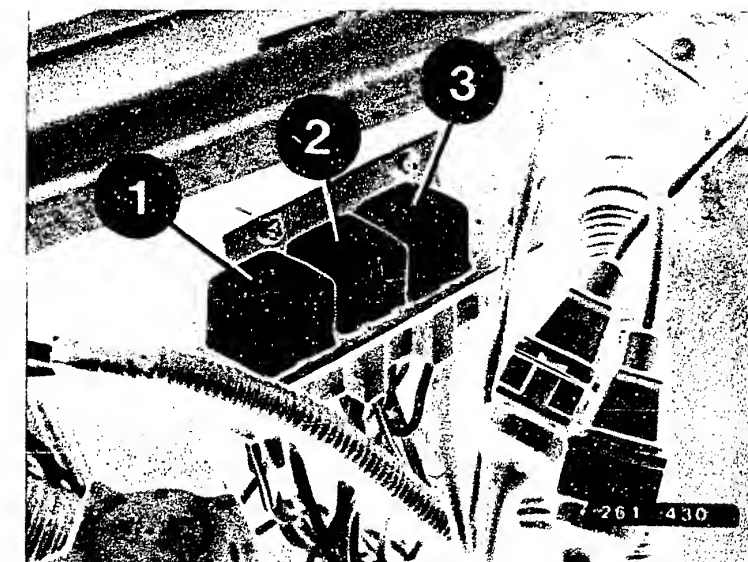
- The relay coil including leads has already been tested with the test adapter.
- Switch on ignition and measure voltage at relay 3/term. 87. Nominal value approx. 0 V: i.e. no current flow between term. 30 and term. 87 (see circuit diagram).
- Wiring harness OK?

Pull off relay 3 and measure voltage at term. 87 again with ignition on:
Nominal value approx. 0 V.

Is lead to solenoid-operated valve connected at relay 3/term. 87? There must be no voltage present at the solenoid-operated valve (ignition on).

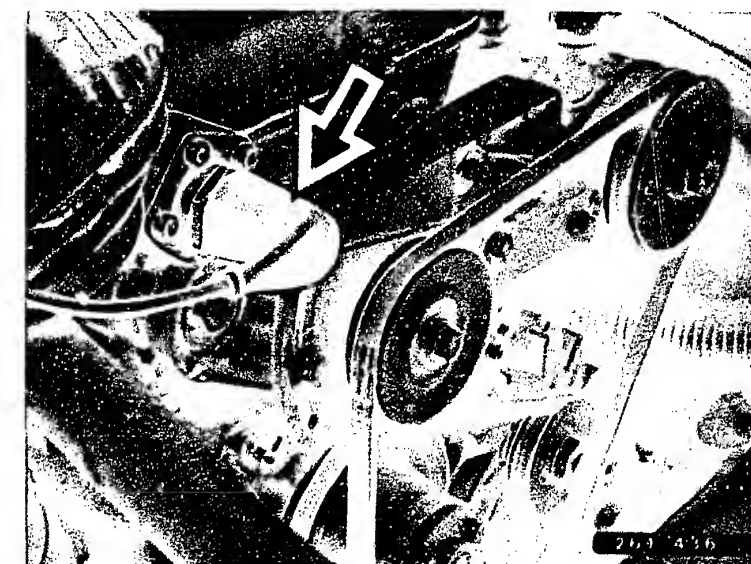
yes

Continued on L7/L8



- 1 = Relay 1 (pump relay)
2 = Relay 2 (main relay)
3 = Relay 3 (camshaft energization)

Arrow = Solenoid-operated valve
for camshaft actuation



L5

CO adjustment

Alfa Romeo Alfa 90



L6

CO adjustment

Alfa Romeo Alfa 90



CO adjustment at idle too low or too high (continued)

yes

Are all hose lines and electric leads securely attached?
Visual examination.
Is the air-intake system leak-tight?

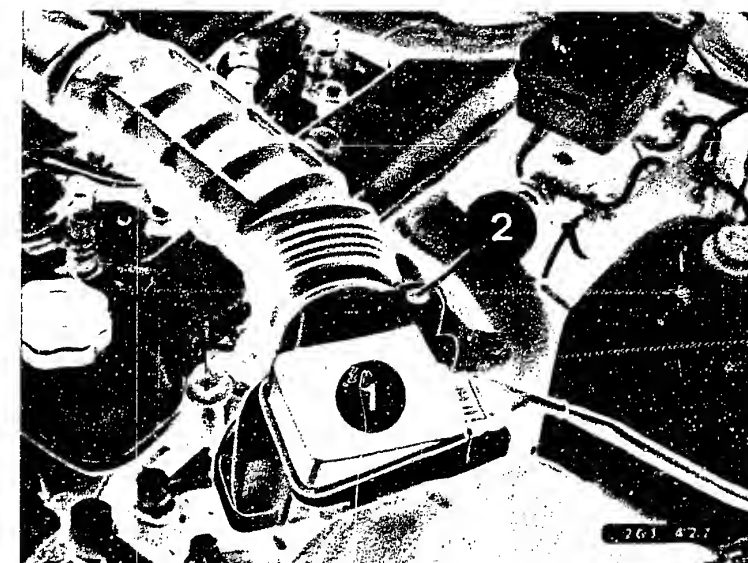
no

Check whether hoses of air-intake system and of fuel line system are securely attached, not kinked or damaged. If necessary, replace hoses. Eliminate leaks with new seals or by re-tightening the connecting screws.

Leak test: Seal off exhaust tail pipe. Open air filter and seal off air-flow sensor duct. Pull off hose after auxiliary-air device and blow air (approx. 0.3 bar gauge pressure) into the intake manifold with a compressed-air gun. Seal off connection port on auxiliary-air device. Open throttle valve fully while doing this. Brush or spray all joints with leak-detector spray or soapy water. Bubbling or foaming indicates a leak. Check electrical plug-in contacts for loose contact. Spring contacts in the connectors must not allow themselves to be pushed back.

yes

Continued on L9/L10



1 = Air-flow sensor with NTC I
2 = Idle-mixture-adjusting screw

L7

CO adjustment

Alfa Romeo Alfa 90



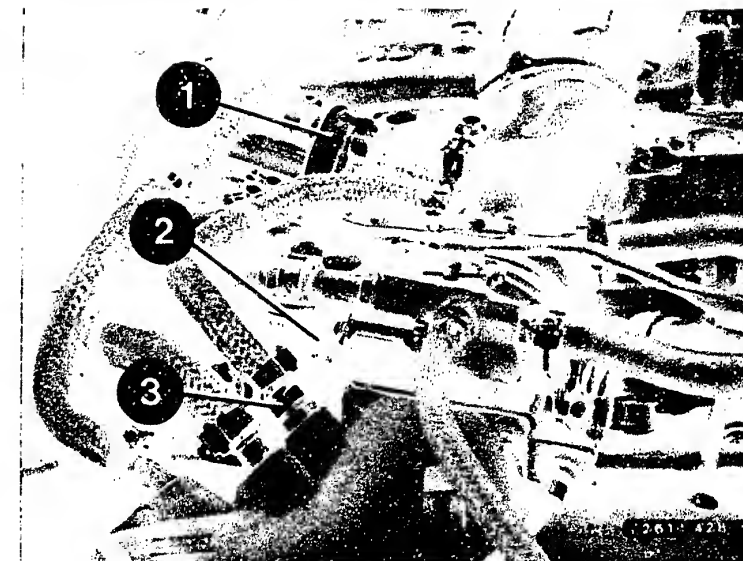
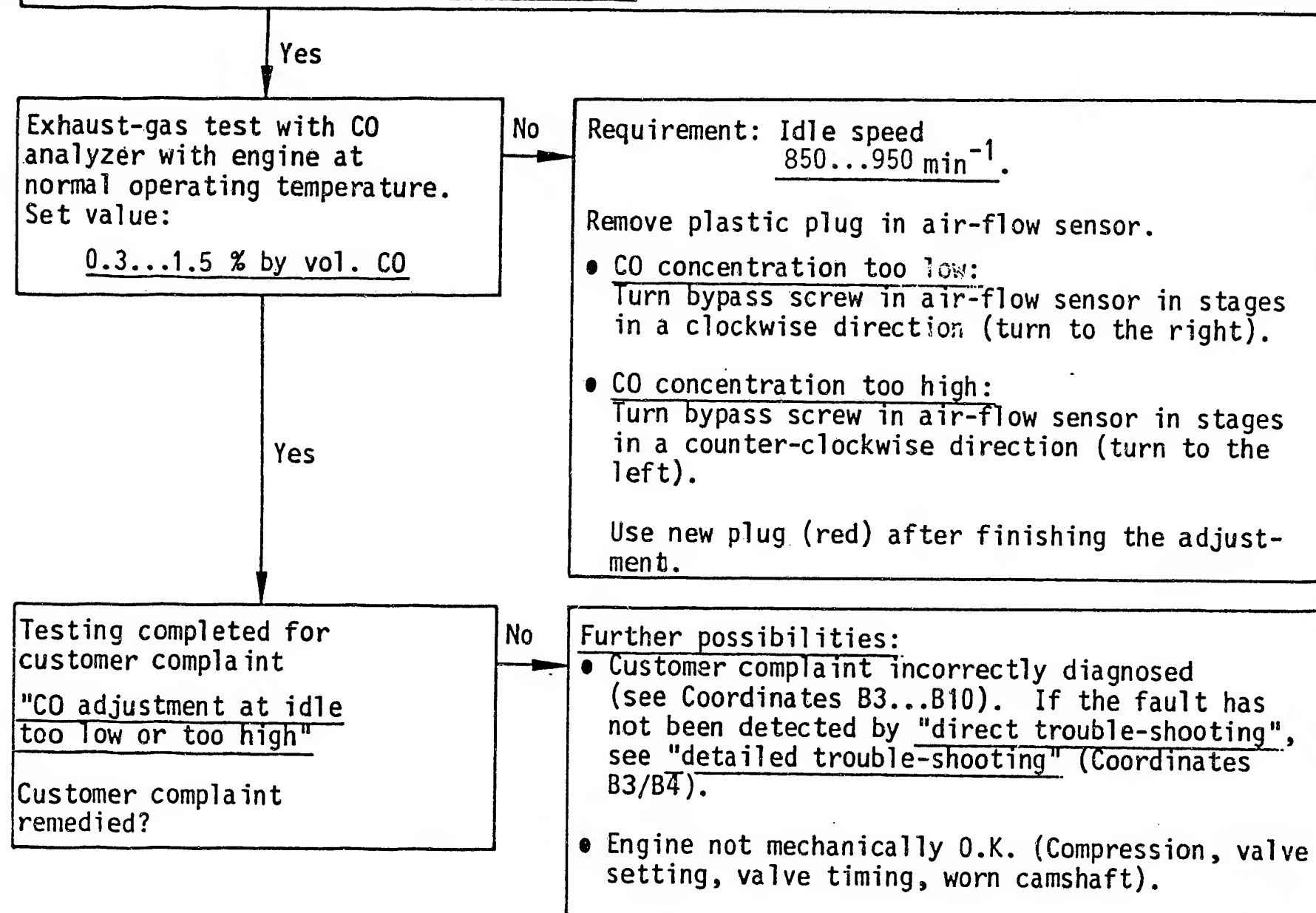
L8

CO adjustment

Alfa Romeo Alfa 90

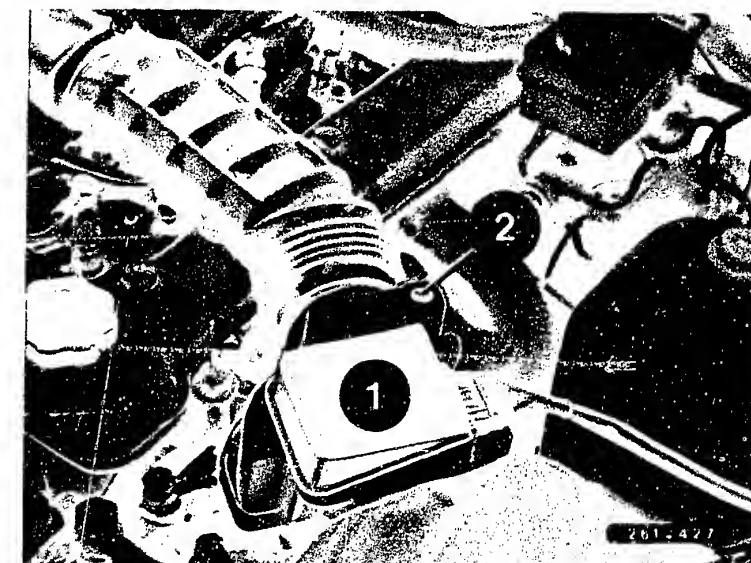


CO adjustment at idle too low or too high (continued)



3 = Idle-speed adjusting screw

1 = Air-flow sensor with NTC I
2 = Idle-mixture-adjusting screw



L9

CO adjustment

Alfa Romeo Alfa 90



L10

CO adjustment

Alfa Romeo Alfa 90



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11. Trouble-shooting program according to customer complaint

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